International Cooperation For the Prevention of Marine Oil Pollution

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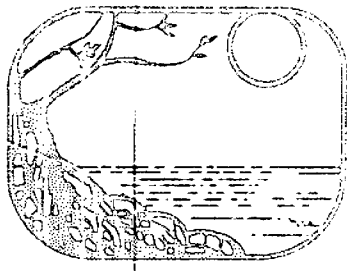

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CHAPTER I
SCOPE OF THE PROBLEM

1:1 INTRODUCTION

Although this paper examines specifically the problem of oil pollution of the marine environment by vessels, the underlying theme concerns the interdependence of everything on the Earth. This dependence demands cooperation by man on an international scale. Hopefully, the possibility of ecological apocalypse can bestir genuine cooperative effort among nations.

This paper provides an overview of the problem as it exists prior to the 1976 New York Law of the Sea Conference. To examine the question properly, initial definitions must be provided concerning the marine ecosystem, oil, and the interaction of these two. Next the paper explains international awareness of the problem and the general history of international cooperation. Then the various international agreements concerning oil pollution of the marine ecosystem are discussed. Finally this writing details the most recent developments leading up to the 1976 New York meeting.

It is the intent of this paper to provide much of the technical and economic background necessary to understand the necessity for international cooperation while at the same time providing a discussion of its legal context. To this end, the first three chapters of this paper appear somewhat technical and bear little resemblance to what is normally considered legal writing. The paper then traces the development of international law and cooperation from their earliest origins to the most recent developments. Again, more detail than seems absolutely necessary is presented in order to provide adequate background material for proper understanding of the situation. The paper concludes with a discussion of recent trends in the area and some predictions for the future as well as some suggestions as to how the problem might be handled.

As to the outset, one must become cognizant of the importance of the

importance of the marine ecosystem. In short, the existence of all life on Earth depends upon the oceans. The complex hydrocycle of this planet and its living organisms symbolize the core of human existence. Furthermore, the oceans represent the keystone in this important cycle.

1:2 ECOSYSTEM OF THE MARINE ENVIRONMENT

Commensurate with its importance, the physical dimensions of the marine ecosystem dwarf anything existing on the land. The oceans cover 70.8 percent of the Earth's surface. Trenches within this vastness descend to a depth of 37,800 feet versus the mere 5,000 feet depth of the Grand Canyon.[1] Mauna Loa volcano rises more than 30,000 feet from the floor of the Pacific as compared with the 29,000 feet height of Mount Everest.[2] Seventy-seven percent of the ocean has a depth in excess of 9,000 feet.[3] Eleven major components constitute sea water with chlorine, sodium, sulfate, and magnesium being present in the largest quantities.[4]

A biologically based topography would be most useful in describing the marine ecosystem. Broadly speaking, the marine ecosystem divides itself between the neritic (near shore) and oceanic areas. In addition, each of the following zones encompasses a separate habitat for marine organisms. Beginning where the highest tides splash the rocks, one finds in descending order the supratidal, intertidal, subtidal, lower neritic, bathyl, abyssal, and finally the hadal in the deep ocean trenches.[5] The concept of the euphotic layer lies over these zones like a blanket and links them together with its premier importance to all sea life. This layer extends from the surface of the ocean to a depth of approximately 30 meters. Below this depth, photosynthesis cannot occur because sunlight penetrates insufficiently. The causes of this exclusion of light include reflection, scattering, and absorption as heat energy.[6]

As on the land, photosynthesis forms the basis of all life within the marine ecosystem. In terms of gross productivity, the oceanic area leads with 82 percent in comparision with 18 percent for the neritic area.[7] The fallacy of the figures becomes apparent when one observes that

the oceanic area encompasses a sphere nine times that of the neritic area, and all of the oceanic area has a 30 meter depth while only a portion of the neritic area has a depth of 30 meters. When comparing a more relevant figure such as the rate at which plants store energy via photosythetic activity in the form of organic substances, one discovers that the neritic area generates ten to thirty times more productivity than the oceanic area.[8]

Phytoplankton refers to the microscopic plants responsible for the vast majority of this photosynthesis. These plants belong to the pelagic portion of marine life as opposed to the benthic portion which remains in contact with the seabed. The pelagic group which floats through the ocean includes, in addition to phytoplankton, the zooplankton.[9] Nekton form the remaining portion of pelagic organisms. Nekton are all animals able to propel themselves through the water. The importance of the pelagic group stems from the fact that almost all forms of sea life (pelagic and benthic) spend a portion of their life cycle as zooplankton.

Although all sea life can exist within the euphotic zone, those vast regions of the ocean below 30 meters cannot sustain producers. The animals which populate this realm depend upon organic matter which falls from the euphotic layer.

While the geographic boundaries of the neritic area can be easily perceived, the barriers of the oceanic area seem more elusive, but they exist nonetheless. Many pelagic species are fenced in by walls of salinity, temperature, or current in the same way neritic life can be hemmed in by the shoreline.

The neritic area with its high productivity deserves special attention. Of the neritic waters, those with an influx of fresh water at one end and an ocean tidal action at the other end form the most prolific areas.[10] These estuarine systems form a nutrient rich zone due to the mixing of the different waters. The tremendous variability of this habitat in terms of salinity, temperature, and wetness demands organisms

of wide tolerance.[11] The early life stages of most commercial fish take place in these nutrionally abundant estuaries.

In addition to the pelagic and benthic species, a sizeable number of birds and mammals derive their sustenance from the estuaries. Many birds become as "attached" to the strip of land between low and high water as do the clams within the substratum.[12]

Although this marine ecosystem delineates an awesome physical and biologic structure by itself, the marine environment also bestows life on the continental land masses. The most obvious benefit derived from the marine ecosystem comes from its dominant position in the hydrocycle. Even though lake evaporation and plant transpiration contribute to continental air masses, the maritime air mass formed by evaporation from the oceans brings the real supply of water so necessary to the continents; and the ocean collects the majority of this water in the end.[13] Another usefulness comes from the vast amount of photosynthesis. This reaction constantly removes carbon dioxide from the water and places oxygen into the water. At the ocean atmosphere interface, this should influence the diffusion of oxygen into the atmosphere.[14]

Of particular importance to this paper is the capability of the oceans to absorb wastes. Referring back to the discussion of the ocean's physical structure, one observes that these basins constitute the lowest points on the Earth's surface. Purely natural activities of erosion and land runoff insure that a rock from the highest mountain eventually arrives at the bottom of the ocean. Until recent times, the vastness of the oceans could dilute whatever fell into it from the continents. In fact, those particles of organic and inorganic matter complete the nitrogen and carbon cycle of the Earth.

Added to these factors of major importance to the world's environmental cycles are specific benefits to mankind. The food energy potential of the ocean cannot be overly stressed.[15] The productivity of a

wheat field approximates 1.5 tons per acre, whereas an acre of estuarine marsh produces 10 tons.[16] This region functions as a nursery for the majority of the fish man catches. The present restrictions on protein from the ocean focus on man being only a tertiary consumer at best. The often described food chain shows how an energy factor of 1,000 at the phytoplankton stage is reduced to a factor of 1 by the time man places it on his table.[17] When talking of the oceans as a food source, limiting factors constitute the most important aspect in determining primary productivity. Light, temperature, turbulence, phosphate quantity, phytoplankton respiration, and zooplankton grazing maintain a direct control over output.[18] Man's harmful or beneficial effect on each of these factors determines whether he reaps a harvest or creates a desert. Each year industry's demand for raw materials increases and the availability of these items on the continents decreases. Therefore, the oceans become of continuing greater importance in the quest for additional mineral resources. The present Law of the Sea Conference presents an example of just how important this aspect has become.

Finally, the ocean appeals to man's intrinsic desires as both aesthetically pleasing and a source of recreation. In the United States alone, there were more than 40,000,000 individuals involved in boating on over 6,830,000 boats during 1974.[19]

1:3 NATURE OF POLLUTANTS IN THE MARINE ENVIRONMENT

Unfortunately, the grim specter of pollution casts itself over the marine environment. This paper approaches the problem from three directions (type, source, and effect.) The following statement defines pollution of the marine ecosystem as this writing employs the term:

> Introduction by man, directly or indirectly, of substances or energy into the marine environment (including estuaries) resulting in such deleterious effects as harm to living resources, hazards to human health, hindrance to marine activities including fishing,

impairment of quality for use of sea water, and reduction of amenities.[20]

The Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) divides pollutants into eight types: halogenated hydrocarbons, nutrients, inorganic chemicals, suspended solids, radioactive substances, thermal waste, petroleum and its derivatives, and other organic chemicals. Since the problem here concerns petroleum and its derivatives, only a cursory examination can be given to the other seven types.[21] The following table comprises GESAMP's list of harmful substances found in the sea:[22]

Domestic sewage	o-dichlorobenzene
Organophosphorus compounds	p-dichlorobenzene
Carbonate compounds	Epichlorohydrin
Herbicides	Ethyl alcohol
Mercurial compounds	Ethyl benzene
Acids and alkalies	Ethylene chloride
Nurtients and ammonia	Napthentic acid
Cyanide	Phenol
Sulphite	Phtholate esters
Titanium dioxide wastes	Styrene monomer
Mercury	Toluene
Lead	Toluene diisocyanate
Zinc	Trichlorobenzenes
Chromium	Vinyl acetate
Cadmium	Vinyl chloride
Arsenic	Xylene
Radioactive materials	Cresol
Oil	Cumene
Acetone	Pulp and paper wastes
Acrylonitrile	Military wastes
Benzene	Heat
Carbon disulphide	Detergents
Chlorobenzene	Solid objects
Chloroform	Dredging spoils and inert wastes
Crotonaldehyde	
Polychlorinated biphenyl compounds	

Halogenated hydrocarbons include synthetic chemicals such as organo-chlorine pesticides like DDT. Although the ocean tends to dilute these chemicals, many organisms have the ability to concentrate these pesticides in quantities 70,000 times greater than their presence in the surrounding ocean.[23] Biological magnification exponentially

increases this problem as the chemicals proceed through the food chain. Unlike organic matter, the ocean cannot recycle these substances into the life cycle of the marine ecosystem.

Nutrients normally present a limiting factor on phytoplankton productivity; however, when present in overabundance, phosphates and nitrates lead to the destruction of phytoplankton. The nutrients begin to decay with a resultant high biochemical oxygen demand (BOD). In time this creates a eutrophic situation, and only bacteria and other anaerobic microbes can continue to survive in the water.

Inorganic chemicals such as copper and mercury may have a direct toxic consequence for marine organisms. They may also have a more insidious effect on the marine ecosystem by their mere presence which can deceive sensitive biochemical sensors in marine life.[24]

Suspended solids constitute foreign objects in the marine ecosystem from styrofoam cups to fine particulate matter from an industrial smoke stack. Most organic solids come from sewage. Besides the BOD of this material, viruses can be directly consumed by filter feeders with the resultant chance of infectious hepatitis from human consumption of the shellfish.[25]

Radioactive substances represent a problem due to the endless time frame required for the decay of radioactivity. No place exists where these materials, which constantly grow in quantity with generating plants, may safely be disposed.

Thermal waste like radioactive waste expands commensurate with the demand for more and more electrical energy. These generating plants normally discharge their hot water into the important estuarine areas. Temperature represents a limiting factor just like nutrients, and its effect on dissolved oxygen and salinity can be lethal for estuarine inhabitabts.

Petroleum and its derivatives are discussed in detail later in this

paper.[26] As in the case of thermal and radioactive pollution, the demand and use of this substance by the industrial world has resulted in several grave consequences for the marine environment. With a little luck, the marine environment might outlive the period when massive amounts of petroleum remain available to mankind.

Other organic chemicals include an infinite variety of proteins, phenols, solvents, and detergents. One estimate states that there are 20,000 new organic chemicals synthesized each year, and 1,000 of these reach the market as products.[27] Eventually, each one of these substances or the waste created from its production can infiltrate the marine ecosystem.

The continental land mass, the marine environment, and the atmosphere constitute the three major sources of pollutants. Rivers are one of the prime transporters of continental pollution. Agricultural runoff in the form of nutrients, halogenated hydrocarbons pesticides, and organic matter create marked effects upon the ecosystems of the rivers and oceans. Additionally, large river systems such as the Mississippi receive and transport all the pollutants discussed below in regard to the estuarine area.[28]

Man subjects the estuarine area at the interface of the land and the ocean to the full impact of his polluting capability. It seems indeed paradoxical that the area most important to the marine ecosystem has been designated by man for the greatest abuse. Besides the pollutants delivered at the river end of the estuary, innumerable polluting sources normally exist within the estuarine area itself.

Domestic sewage usually contains all of the above named pollutants with the exception of the radioactive and thermal wastes. Petroleum products wash off the roads and arrive at the estuary via storm drains Tremendous quantities of organic matter and nutrients enter by way of sewer systems which lack adequate treatment stages.

Industrial wastes rival domestic sewage for prominence in the onslaught upon the estuarine area. Huge amounts of organic and inorganic chemicals pour into estuaries every day, and the problems of thermal pollution and suspended solids also exist. Most political entities fail to assess any cost factor on industrial pollution, and laying a pipe into the estuarine area represents the most effective procedure for disposing of unwanted by-products.[29]

A third source of pollution in this area originates from development of the contiguous upland and estuary itself. Dredge and fill operations in the coastal zone excavate some benthic life and deposit this upon the upland. Other benthic life suffocates under several feet of fill. Also, these activities disperse vast quantities of suspended solids throughout the area. This constitutes the most physically destructive act of man upon the estuaries.

Lastly, the estuarine environment must contend with recreation. Beer cans, plastic wrappers, untreated human waste, fuel oil, anchors, and turbulence thrust themselves upon this zone. Although some pleasure boats venture into the oceanic area, the majority of the population spend all of their time within the safety of the neritic area.

The oceanic area of the marine ecosystem stands as the second major source of pollution. Beginning with the subsoil of the oceans, there can be seepage of petroleum and natural gas attributable to natural geologic forces. More plausibly, man's efforts at mining soft minerals underneath the ocean floor result in massive damage analogous to the Santa Barbara oil spill. In addition, the preparatory work for an undersea mining operation creates some of the same problems mentioned in the discussion of dredge and fill evolutions.

While not specifically a source of pollution, the vertical and horizontal ocean currents transport polluting substances throughout the marine ecosystem.[30] The paramount source of pollution within the water column consists of the biotoxins produced by marine organisms, but man

also contributes with thermal pollution from his submarines. The death of species in all but the upper 30 meters of this zone hopefully minimizes the danger created by these pollution sources.

The surface layer of the marine environment happens to be the most important stratum and also the zone afflicted by the greatest number of pollutants. Every vessel with an overboard discharge disperses some addition to marine pollution whenever it undertakes a voyage. Vessels pump both bilge and domestic waste over the side in the oceanic area, but the real danger from marine transportation resides with the bulk carriers. These vessels convey large quantities of potentially polluting petroleum, chemicals, and ore.[31] Difficulty exists in maintaining ecological awareness when the seaman has seen nothing but empty horizons for days. Although minor in comparison with merchant vessels, recreational boats also contribute to the pollution of the surface layer.

The massive dumping of wastes and other matter in the oceanic area directs attention to another problem. The economical value of most land in the coastal region prevents the disposal of waste in upland dumps.[32] Therefore, barges containing all pollutants except thermal and radioactive wastes routinely discharge their loads in the ocean. The danger from such operating procedures appears to rise proportionally with the proximity of the estuarine areas. Governments add further complexities to this problem by dumping chemical and biological weapons and nuclear wastes in the ocean.

A future source of pollution may be discovered in the operation of offshore power plants. As in the case of shore based generating plants, the main pollutant should be thermal wastes.

Finally and most important of all, the atmosphere functions as a prime source of pollutants in the marine ecosystem. Based on surface area alone, the majority of the pollutants which settle out of the atmos-

phere must alight on the oceans. Scientists estimate that up to 9,000,000 metric tons of petroleum hydrocarbons enter the marine ecosystem from the atmosphere each year.[33] The lack of sufficient data and universal monitoring techniques renders this a domain of questions rather than answers.

The final portion of this inquiry into the nature of pollutants concerns their effect upon the marine ecosystem. The effect of pollution can be apportioned among four major subdivisions.[34]

First, the outright destruction or unfavorable modification of estuarine areas.[35] The mistreatment of these nurseries potentially threatens the existence of entire species or at least a drastic reduction in the output from the most productive zone of the Earth's ecosystem. Second, adverse effects can transform the physical property of seawater. The following description particularizes the problem associated with an over abundance of nutrients and organic matter:

> In most cases, however, depletion of dissolved oxygen arises from the attack of bacteria on the organic constituents, utilizing oxygen in the process of respiration. Once the water has reached zero dissolved oxygen, it may go into a reduced state where oxygen is removed from sulphate and nitrate in the water to produce toxic sulphides and ammonia.
>
> While the lack of dissolved oxygen causes fish to suffocate, poisonous hydrogen sulphide actually creates a toxic condition for marine organisms. In advance stages of organic pollution, not only fish fail to survive, but many of the pollution resistant invertebrates cease to live. The waters become highly offensive because of a noxious hydrogen sulphide odor and only anaerobic bacteria survive.[36]

Excess suspended solids can be another damaging physical effect. This particulate matter increases the chance of light scattering and thereby reduces the maximum depth of the euphotic zone in that area.

Third, marine organisms can succomb to the acute or sub-lethal effects of toxins. An example of a sub-lethal consequence would be a toxin which deceives a biologic sensor causing a scallop to remain shut during its normal feeding period. Fourth, one must be concerned with the bio-accumulation of harmful substances such as inorganic chemicals and pathogenic organisms in the food chain. Concentrations of zinc and copper have been discovered infilter-feeding invertebrates such as oysters.[37]

1:4 MAGNITUDE OF THE PROBLEM

The recorded history of mankind established beyond a doubt the insensitivity of man to his environment. As Anne Lindbergh has declared:

> It will take a "revolution in values" to save the world and that what is needed is a new ethic that thinks and acts in terms of guardianship of the planet and its life.[38]

The recognition that waste disposal encompasses only one of the many services performed by the marine ecosystem constitutes a strong basis from which to explore the problem. If the oceans could assimilate unlimited quantities of waste, then the problem would not exist. In actuality, the oceans possess only a finite capacity for pollutant disposal. Therefore, any quantity of pollution beyond this finite milestone must evidence some reduction in the additional services provided by the marine ecosystem.

Again, one comes face to face with the interdependence of life cycles. The ecosystem of the Earth does not belong to man. To the contrary, he exists as an inextricable part of the ecosystem and the ecosystem is a part of him.[39]

An initial obstacle in discussing this problem stems from the lack of data and knowledge previously accumulated. Only as recently as 1969 did international agencies decide upon a definition for marine pollution.[40] Even potable water could be a pollutant within this definition if an

increased quantity of fresh water causes the salt water wedge of the estuary to retreat toward the ocean and thereby destroy those attached benthic plants which depended upon the salinity. Every study seems to discover new types, sources, and effects of pollution.

The inadequacy of man's knowledge appears most salient in respect to the effects of pollutants on the marine ecosystem. With the present state of the art, "conditions requisite to the onset of an irreversible reaction of catastrophic proportions "[41] can establish themselves without the slighest recognition by man. As an examples, one might consider the short term aftermath of one sea bird killed by an oil spill. The fish that bird would have consumed will not sink to the bottom when it or its predator dies where it will undergo bacterial decay. On the other hand following the bird's digestion of the fish, the bird would have excreted nutrients on the surface of the sea where they could have been available to the producing organisms of the euphoric layer. Long term consequences might include substantial nutrient loss to the oceanic euphotic layer and extinction of a bird species.

Pollution of the marine environment poses a very complex problem for the existing political entities to solve. Two immediate hurdles to cross concern the distribution and magnitude of pollutants. Pollutants which flow into the natural ocean transport system do not recognize the national boundary lines which man theoretically employs to divide up the oceans. This fundamental principle will continue despite any increase in the size of sovereign domains. Secondly, the universal nature of this pollution makes it difficult to create realistic regulations which establish mere national goals. "Today nearly every identifiable social or economic interest group is actively engaged in the destruction of our environment."[42] Industry puts to use vast quantities of water and rids itself of unwanted by-products by dumping them into the ecosystem. Food processors discharge organic wastes, steel factories pour in acids, and the power utilities put hydrocarbons into the

atmosphere and inject thermal wastes into nearby waters. Individuals with their automobiles and consumer demands constitute the most significant contributors to this pollution. With everyone taking such an active part in pollution, it seems politically infeasible to assign responsibility.

Those who favor a nation-by-nation approach to the problem point out that each state first pollutes its own waters, be they rivers or neritic areas. With the exception of isolated disasters, such pollution continues as a daily occurrence; and acceptance of national pollution precedes any harmful affects upon other nations.[43] Nationalists believe that the answer lies in regulation of these local problems by the individual countries. When speaking in terms of political time, the duration required to arrive at meaningful national solutions represents a significant time reduction in comparison with the slow and complex workings of any international assembly.

In addition, the reformers must constantly battle with the vested interest of sovereignty. A coastal nation confronts significant problems when a foreign vessel outside of its territory acts in a manner which the coastal state designates as detrimental to its environment. This problem increases in complexity if the offending vessel not only lies outside of the coastal state's jurisdiction but also within the territory of a third state.

Superimposed on this complex web of legal and economic issues lie some imposing social decisions.[44] Even when discussing pollution problems which are capable of imparing health, most of the world conceives of this problem as a diversion. Also, each nation which opts for concern in regards to the marine ecosystem fashions a decision to reallocate its natural resources.[45] A healthy ecosystem must be discussed in terms of less food, steel, housing, transportation, and the other goods and services of modern living.

Mankind depends upon the marine ecosystem for its continued existence; however, he assaults this same life-giving resource with pollutants. The types and sources of pollution match the variety of man's industrialized society. To a great degree, the magnitude and effect of pollution remain unknown to the scientific community. Difficult decisions must be rendered by governments to isolate the problems of pollution and discover solutions.

FOOTNOTES CHAPTER I

1. K. CRITCHLOW, INTO THE HIDDEN ENVIRONMENT 50 (1972).

2. Id. at 53.

3. G. DIETRICH, GENERAL OCEANOGRAPHY 10 (1963).

4. Id. at 49.

5. E. ODUM, FUNDAMENTALS OF ECOLOGY 334 (1959).

6. G. DIETRICH, supra note 3, at 75 for a detailed discussion of light extinction.

7. Pomeroy, The Ocean's Food Web, A Changing Paradigm, 24 BIOSCIENCE 499 (1974).

8. E. ODUM, supra note 5, at 75.

9. A. HARDY, THE OPEN SEA: ITS NATURAL HISTORY (1956) for an in depth study of pelagic life.

10. E. ODUM, supra note 5, at 364.

11. Id. at 338 contains a good description of life in the neritic area.

12. Id. at 350.

13. K. CRITCHLOW, supra note 1, at 69.

14. G. DIETRICH, supra note 3, at 350.

15. Pomeroy, supra note 7, on the theory of energy outside of the classic food chain.

16. R. WAGNER, ENVIRONMENT AND MAN 152 (1971).

17. W. CROMIE, THE LIVING WORLD OF THE SEA 308 (1966).

18. E. ODUM, supra note 4, at 104.

19. BOATING STATISTICS 1974 (U.S. COAST GUARD Pub. No. 357, 1975).

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21. Hull & Koers, A Regime for World Ocean Pollution Control, in INTERNATIONAL RELATIONS AND THE FUTURE OF OCEAN SPACE 83 is an excellent survey of pollutants.

22. Waldichuck, Coastal Marine Pollution and Fish, 2 OCEAN MANAGEMENT 1, 90 (1974).

23. W. BURKE, CONTEMPORARY INTERNATIONAL LAW OF THE SEA V7 (1973).

24. DeClerck, Vandestappen, & Vyncke, Mercury Content of Fish & Shrimps Caught Off the Belgian Coast, 2 OCEAN MANAGEMENT 117 (1974) for a one year study showing the effect of mercury.

25. W. BURKE, supra note 23, at V 14.

26. See text accompanying note II-33 infra.

27. Waldichuck, supra note 22, at 39.

28. ZWICK & BENSTOCK, WATER WASTELAND (1971) is an excellent source for pollution data of American rivers.

29. Tybout, Pricing Pollution & Other Negative Externalities, 3 BELL J. OF ECON. MANGE. SCI. 252 (1972) gives an economic analysis of the cost of pollution.

30. G. DIETRICH, supra note 3, chapter VII presents a thorough examination of the theory of ocean currents.

31. See text accompanying note III-29 infra for a description of the quantities and dangers involved in the bulk carriage of materials.

32. Pearson, Exacting Rent from Ocean Resources: Discussion on a Neglected Source, 1 OCEAN DEVELOPMENT & INT'L L. J. 221 (1973) on the concept of placing a tax on the right to pollute.

33. Id. at 224.

34. Waldichuck, supra note 22, at 54.

35. Id. at 5.

36. Id. at 24.

37. Danzig, Marine Pollution - A Framework for International Control, 1 OCEAN MANAGEMENT 347 (1973).

38. Id.

39. K. CRITCHLOW, supra note 1, at 7.

40. See text accompanying note 20 supra.

41. Hull & Koers, supra note 21, at 85.

42. Reitze, Pollution Control: Why It Has Failed, 55 A.B.A.J. 923 (1973)

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CHAPTER II
AN EXAMINATION OF THE PROBLEM OF OIL POLLUTION OF THE MARINE ENVIRONMENT: CHARACTERISTICS

2:1 INTRODUCTION

Man has always used the ocean as a cesspool for his wastes. It still seems to some that the capacity of the ocean to absorb wastes can never be exceeded. Indeed, it took an industrial revolution to give man the ability to do so. As man has increased both his population and industrial activity, there have been growing signs that the oceans are in danger from a variety of pollutants. Unfortunately, there is a great lack of knowledge as to the types, sources, and effects of these pollutants.

The problem of pollution of the marine ecosystem does not exist solely on a local or even national level. It is international in scope. The oceans and their pollutants are not respectful of national boundaries. All the nations of the world share the global environment. What pollutes the ecosystem of one has its effects on that of the other. Because the problem is international in scope, its solution is subject to the many complexities of international politics and economics just as U.S. ecological problems are the focus of conflicting national economic and political sectors. In addition to the many technical, political, and economic complexities which prevent achievement of effective pollution control within the U.S. (multiplied on a global scale), the problem of global pollution of the marine environment also must deal with great cultural and philosophical diversities. Its solution depends on the cooperation of many sovereign nations all jealous of their independence and reluctant to subject themselves to international standards of conduct.

As discussed in Chapter I, the problem of pollution of the marine ecosystem is a serious one with far ranging economic and technical complexities. In order to understand these complexities and how they affect the problem of marine pollution, it is both necessary and

desirable to examine one particular pollutant in detail. Oil pollution of the marine ecosystem is particularly well suited for such a detailed study. Unlike many pollutants, nations have been aware of the problem for many years.[1] It has generated a great deal of concern, especially in the past few decades, and its effects have been well studied and documented. It also lends itself to practical solutions now, whereas most other pollutants will require additional study before science can hope to cope with them realistically.

Oil pollution also bears an appropriate relationship to the international political and economic complexities of the total world marine pollution problem. Since the pollutant involved is oil, all the difficulties associated with the energy crisis, the Arab oil embargo, the Middle East situation and the Third World enter the picture. From an economic point of view, the high cost of oil is a major cause of inflation; anti-oil pollution measures which would conceivably raise these prices can be expected to be unpopular. Oil is also a major element of the modern technological society from supplying fuel to run factories and power stations to being an important component in plastics and fertilizers. The use of oil in fertilizers ties the oil problem into another major world problem of maintaining adequate food production. Oil and its attendant problems of pollution and supply, therefore, are of major concern to all the nations of the world both developed and less developed.

Because of this importance of oil, any discussion of anti-pollution measures must be considered in relation to this background of oil as a major factor in world affairs. Any discussion of these larger problems dealing with oil is beyond the scope of this paper but must be borne in mind when discussing the background of oil pollution and possible solutions.

The problem of international oil pollution of the marine environment also requires some limitation. As will be discussed infra, the problem

divides itself into landbased and marine-based oil pollution sources. Although land-based sources are a major cause of marine oil pollution, because of complexities involved with discussing international control of land-based sources (ie. territorial sovereignty) and a dearth of scientific knowledge about the sources and extent of this pollution source, it will only be discussed peripherally. Maritime sources are much more suitable for a discussion of the international ramifications of the problem and more amenable to solution by international cooperation since land-based sources are wholly within the domestic jurisdiction of a nation; traditionally a verboten area for international efforts.

Of the various maritime sources, vessel source pollution presents the best topic for examination and analysis. Not only is it the best developed and researched area of marine oil pollution, but the international bulk carriage of oil and its importance to maritime commerce presents an excellent medium for a discussion of the international aspects of the problem.[2] Vessel source oil pollution is also the major source of maritime-based marine oil pollution, as will be seen. The primary thrust of this paper, therefore, will be the legal and technical context of vessel source oil pollution of the marine ecosystem.

2:2 SCOPE OF THIS CHAPTER

A great deal has been written concerning oil pollution in the last fifty years. Since the major oil pollution disasters of the 1960's, such as the Torrey Canyon and Santa Barbara Channel oil spills, the volume has swelled to epic proportions.

Many of these articles have dealt with certain aspects of the problem from a legal or technical point of view. Others have surveyed the situation in broad terms. Few have attempted to deal with the total problem from a legal perspective and at the same time provided an adequate treatment of the technical background of marine oil pollution. The technical aspects are extremely important. Without an understanding of how and why oil pollution threatens the world and what the obstacles

are to its solution, any discussion of the legal aspects lacks relevancy. The only way to approach the problem properly is not from a legal perspective or from a scientific perspective but from an interdisciplinary aspect utilizing both.

This paper does not deal with the legal aspects of accountability for oil pollution damage (except as necessary to understand and appreciate the difficulties of international prevention), and control and liability. These problems are at present, largely a matter of domestic law and can not be adequately treated with the space available.[3]

2:3 SOURCES OF OIL POLLUTION

Oil pollution of the marine environment most frequently occurs either as a slick, often associated with large spills directly into the water, or as an emulsion of oil and water resulting from the mixing of the oil through indirect discharge. The form of the pollution as a slick or as an emulsion is often important in determining its effects on the ecosystem as will be discussed infra.

While there are many various types and grades of oil, when discussing oil pollution the chief concern is with two categories---crude oil and refined oil. Crude oil is thick viscuous petroleum in its natural state as it comes from the well-head. It is most frequently associated with long distance ocean transportation in bulk. Refined oil includes fuel, heating, lubricating, and diesel oils as well as gasoline and other varieties. It is associated with operational and industrial uses and coastal transportation from refinery to user. The type of oil, crude or refined, is often important in predicting its effect on the environment. Refined oils are generally more toxic than crudes.[4]

Oil enters the marine environment through a variety of sources. In addition to unknown quantities of petroleum hydrocarbons absorbed by the seas from the air as a result of the combustion of petroleum fuels,[5] oil enters the marine environment from sources on the adjoining land mass and

from within the marine environment itself. The respective contributions of these land and marine-based sources to overall marine oil pollution is the subject of intense debate. Indeed, the amount of oil pollution occurring and its relation to total marine pollution is also contested. This controversy is heightened by the lack of any reliable statistics on the subject and the absence of a comprehensive reports system; forcing the parties to predicate their discussions on estimates.[6]

2:3:1 Land-based Sources

Land-based sources account for 50-90 percent of oil pollution of the marine environment.[7] The sources and reasons for such pollution vary widely. Industrial users often include petroleum residues with other wastes which are discharged directly into streams and rivers via outfalls. Millions of gallons of automobile crankcase oil are deposited annually by service stations and home mechanics into municipal sewage systems whose antiquated plants are incapable of removing the oil before discharging the effluent into the ocean.[8] Accidental spills during transfer, storage, or machinery operation, or as a result of vehicle collisions, are unthinkingly washed into storm drains by workers or firemen as part of the clean-up and fire prevention process. Even oil which is not deposited directly into rivers and streams but onto roads, driveways, dumps, or earthen sumps finds its way to the sea by rains and rivers.[9]

Another type of land-based oil pollution which is a major source of pollution of the marine environment is ocean dumping of wastes, including oil wastes, transported from land by vessels. Although the wastes are not transported by rivers or other natural means, this transport of landgenerated wastes to the sea is properly included as a land pollution source and not a vessel source.

The sources of land-based oil pollution are as varied as petroleum's many uses and users. The quantities involved are almost impossible to estimate. There are literally tens of thousands of little spills of a few gallons or less which are impossible to keep track of

but in the aggregate contribute significantly to total oil pollution.[10]

2:3:2 NON-VESSEL MARINE-BASED SOURCES

The sources of pollution occurring in the marine environment are largely connected with man's activities such as shipping, off-shore oil rigs, maritime commerce, etc. One exception to this is natural seepage of crude oil from deposits under the ocean floor through faults and cracks in the floor structure. These submarine seeps are frequently blamed for oil spills of an otherwise unknown origin and at one time were alleged to be the major source of marine oil pollution. Although such natural seeps are a problem in areas where they occur, they do not contribute significantly to the total oil pollution problem.[11]

In addition to natural seeps, another source of possible pollution which is thought to be a major threat and is frequently blamed for mysterious spills is the estimated 5,000,000 barrels of oils which went down off our coasts on torpedoed oil tankers during World War II. For years, there have been forecasts of ecological disaster when these hulks ultimately rusted through and spilled the oily cargoes trapped within them. Such prophesies have not been borne out by experience. Although there is some minimal seepage from various wrecks along our coasts, an examination of the most potentially damaging sunken tankers by the Coast Guard revealed most to be oil free. One hull revealed some residual oil but no threat of major leakage. Although these examinations are inconclusive, it appears that these sunken tankers are neither the source nor threat of major oil pollution which they were once thought to be.[12]

Offshore drilling for petroleum and natural gas are also contributors to oil pollution of the sea. The chief cause of oil pollution from these sources is the catastrophic accident; such as the 1969 blowout in the Santa Barbara Channel or the Gulf of Mexico oil rig fires. Compared to losses from these sources, operational losses are minimal. The

Louisiana rig fires averaged a discharge of 100 barrels a day[13] after they were extinguished and estimates of the Santa Barbara spill range from 200 to 500 barrels per day with a few estimates as high as 5000 barrels per day.[14]

Despite such spectacular and destructive incidents, offshore drilling presently accounts for a relatively small portion of the world's oil pollution. Estimates vary from 100,000 to 1,500,000 metric tons per year.[15] As the demand for oil increases, the rate of offshore field development can be expected to keep pace and it is estimated that 1/3 of world production will be from offshore sources by 1978.[16] Offshore oil operations on a scale necessary to meet this demand will result not only in increased operational and accidental losses, absent proper safeguards, but also raises the spectre of the "ultimate" oil pollution catastrophe---a collision between a super-tanker and an offshore rig.

A potential source of oil pollution about which little is known is recreational boating. Termed "non-vessel" because such activities are traditionally not associated with maritime commerce, such boats nonetheless present a possibility of major pollution. There are literally millions of these in the U.S. alone, using gasoline, diesel, and lubricating oils.[17] The pollution potential if each boat were to lose as little as one gallon per year is enormous. Such pollution is almost impossible to prevent or control and presents a particularly serious threat when one considers that gasoline and diesel oil are among the most harmful types of petroleum based pollutants.[18]

2:3:3 VESSEL SOURCE OIL POLLUTION-OPERATIONAL LOSSES

Although vessel source oil pollution could be considered to include seepage from sunken ships and ocean dumping from ships, such sources are usually not included in statistics of vessel source oil

TABLE 2-1

RELATIVE SOURCE POINT CONTRIBUTION AND
ESTIMATED TOTAL WORLD MARINE OIL POLLUTION

(in metric tons per year)

POLLUTION SOURCE	LOW ESTIMATE	HIGH ESTIMATE
Air Injection	100,000[4]	600,000[8]
Natural Seepage	100,000[4]	600,000[6]
WWII Tanker wrecks	negligible[7]	negligible[7]
VESSEL SOURCES		
Tankers		
tankwashing	250,000[2]	300,000[3]
deballasting	500,000[3]	1,000,000[2]
accidents	100,000[3]	200,000[2]
Non-tankers		
deballasting	100,000[5]	400,000[5]
bilge pumping	500,000[3]	500,000[2]
accidents	50,000[2]	50,000[2]
terminal ops	30,000[2]	30,000[2]
OFFSHORE OIL OPS		
Operational losses	100,000[3]	100,000[3]
Accidental losses	1,500,000[4]	1,500,000[4]
OFFSHORE DUMPING	500,000[4]	500,000[4]
RECREATIONAL BOATING	Unknown perhaps major	
LAND BASED SOURCES		
Urban & River runoff		1,900,000[8]
Auto crankcase oil & Industrial wastes	450,000[3]	3,300,000[18]
Refineries	300,000[3]	800,000[3]
Accidental Spills	100,000[3]	100,000[3]
ESTIMATED TOTAL WORLD MARINE OIL POLLUTION	4,680,000 tons	11,880,000 tons

Continued on Page 27

TABLE 2-1 (continued)

SOURCES OF STATISTICS

1. R. SHINN, THE INTERNATIONAL POLITICS OF MARINE POLLUTION CONTROL 8 (1974).

2. Bates & Yost, Where Trends the Flow of Merchant Ships?, in THE LAW OF THE SEA: THE EMERGING REGIME OF THE OCEANS 249, 270 (J. Gamble ed. 1973).

3. G. WILSON, MAN'S IMPACT ON THE GLOBAL ENVIRONMENT 266 (1970).

4. Seabrook - Hull & Koer, A Regime for World Ocean Pollution Control, in INTERNATIONAL RELATIONS AND THE FUTURE OF OCEAN SPACE 83, 93 (R.Wirsing ed. 1974).

5. SECRETARIES OF INTERIOR & TRANSPORTATION, A REPORT TO THE PRESIDENT ON POLLUTION OF THE NATION'S WATERS BY OIL AND OTHER HAZARDOUS SUBSTANCES 6 (1968) - High figures extrapolated to cover estimated world shipping.

6. See source 2 above, page 265.

7. Hearings (note 12 supra) page 119.

8. Oil Pollution at Sea - How Much Is Too Much?, BIO SCIENCE May 1975, Vol. 25, No. 5, p. 339.

pollution of the marine ecosystem. Properly included are operational discharges such as losses resulting from tankwashing and deballasting, bilge pumping, transfer operations, and negligent discharges, as well as traumatic losses due to collisions, groundings, fire and explosion and other accidents.

Tankers are the greatest source of operational oil pollution.[19] Pollution from tankers results largely from the discharge of salt water ballast taken into tanks to maintain stability when returning empty to pick up another cargo. The ballast water mixes with the residue of the cargo and is discharged as an oil and water emulsion as the tanker deballasts preparatory to taking on another cargo.[20] Tankwashing, necessary when the next cargo would be incompatible with the last one, also contributes significantly to oil pollution. Although not occurring as frequently as deballasting, tankwashing results in the discharge of all the oil residue rather than just that which is in emulsion and not settled out as recoverable. The amount of oil which may be discharged in these operations is indicated by the approximately 1,200 barrels [21] of oil remaining in the tanks of a 50,000 DWT[22] tanker after the discharge of its cargo. Deballasting operations have been a major source of environmental damage in the vicinity of approaches to loading facilities.[23]

The major operational source of pollution from non-tanker vessels in bilge pumping and bunker deballasting. Waste water accumulates in the bowels of vessels, or bilges, particularly in the machinery spaces, and frequently has a high oil content as a result of machinery drippage. The discharge of such accumulated water is necessary periodically to prevent the bilge water level from reaching dangerous heights. Bunker deballasting is similar to the tanker operation except that the tanks are generally smaller and are used for more toxic fuel oil rather than for cargo purposes. Nevertheless, an estimated 100,000 tons of fuel oils and lubricating oils are discharged

annually into U.S. waters alone by bilge pumping and bunker deballasting by non-tanker vessels.[24] When this figure is extrapolated to the world's merchant fleet, the magnitude and severity of the threat becomes clear.

Transfer operations, both cargo and bunkers, account for a substantial amount of pollution each year. There are many different types of polluting incidents associated with the handling and storage of oil each year. Figures are hard to determine because, frequently, these spills are not reported. The chief causes of these types of spills are equipment failure and human error.[25] Although large spills frequently result, the greatest damage probably occurs from the cumulative effect of numerous small spills.

Human error is a frequent cause of spills. The error can be as simple as a ship's engineer inadvertently turning the wrong valve. Instead of transferring oil from a storage tank to a service tank, it is discharged over the side.[26] Such non-traumatic, human error discharges may be termed negligent operational discharges as distinguished from operational discharges which are the intentional result of normal operations.

2:3:4 TRAUMATIC VESSEL SOURCE OIL POLLUTION

The spillage of oil due to vessel accidents such as running aground, colliding with other ships, striking submerged objects, and catching fire and exploding may be termed <u>traumatic</u> oil spillage. Such incidents have been the subject of widespread publicity and generated much of the present concern about oil pollution of the marine environment. Indeed, it was a series of these catastrophic spills which elevated the issue of oil pollution from the status of a peripheral problem to a major concern of world scientific and political circles.[27]

These incidents result from a combination of factors such as poor aids to navigation, poor charts and hydrographic surveys, crowded sea

TABLE 2-2

STATISTICAL BREAKDOWN OF POLLUTION INCIDENTS IN U. S. WATERS BY CAUSE[a]

CAUSE	NUMBER OF INCIDENTS	% OF TOTAL	VOLUME IN GALLONS	% OF TOTAL
1. Collision	111	1.1	1,455.467	10.9
2. Grounding	46	0.5	763,682	5.9
3. Capsizing	42	0.4	95,950	
4. Fire/explosion	33	0.3	30,738	
5. Other Casualty	128	1.3	1,736,257	
TOTAL TRAUMATIC LOSSES	360	3.6	4,082,094	31.9
6. Tank rupture	135	1.4	600,534	
7. Structural Failure	108	1.1	148,787	
8. Storage tank rupture/leak	129	1.3	123,981	
9. Hose rupture	148	1.5	30,404	
10. Line Leak	1,007	10.1	104,037	
11. Pipe rupture/leak	368	3.7	1,632,419	
12. Other rupture/leak	306	3.1	2,183,160	
13. Valve Failure	584	5.9	50,572	
14. Pump Failure	302	3.0	15,595	
15. Other Equipment Failure	656	6.6	227,588	
TOTAL LOSSES DUE TO EQUIPMENT/STRUCTURAL FAILURE	3,743	37.7	5,117,077	39.9
16. Tank overflow	640	6.5	423,050	
17. Improper Valve handling	193	2.0	416,530	
18. Improper Hose connection	83	0.8	50,381	
19. Other Human Error	371	3.7	50,355	
TOTAL LOSSES HUMAN ERROR	1,287	13.0	940,316	7.3
20. Intentional Discharge	457	4.6	68,515	0.5
21. Natural Phenomenon	256	2.6	2,045,972	15.9
22. Unknown source/cause	3,827	38.5	(est) 551,758	4.5
TOTAL OIL POLLUTION REPORTED U. S. WATERS	9,930	100.0	12,805,732	100.0

[a]Figures based on following report, U. S. Coast Guard, POLLUTING INCIDENTS IN AND AROUND U. S. WATERS: CALENDAR YEAR 1972, at 7, (1973) Figures for Natural Phenomenon and others, altered to disallow the 6,000,000 gals. of oil dumped by Tropical Storm Agnes in June, 1972. It was felt that including these figures would yield a result not representative of any given year. See note 10, supra.

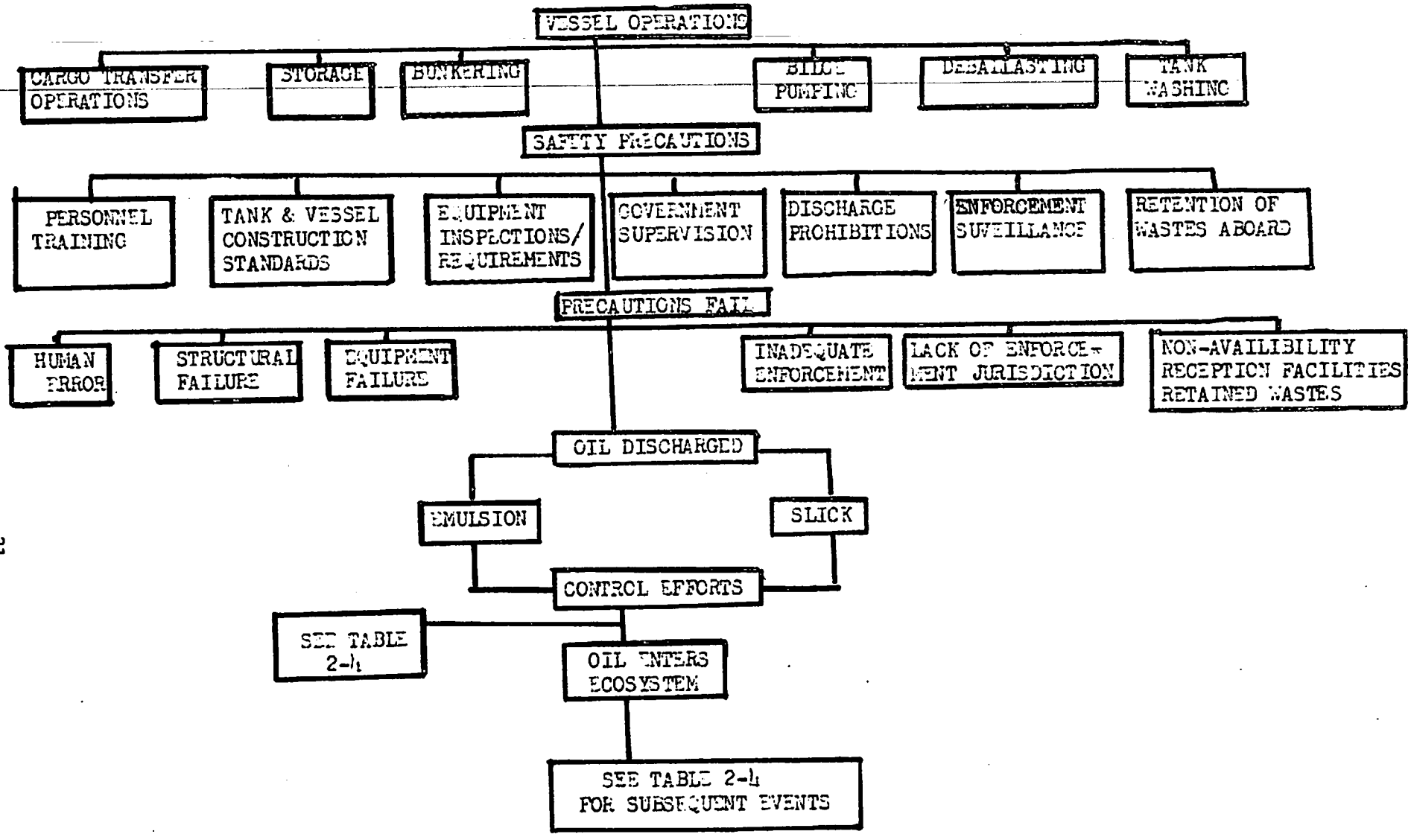


TABLE 2-3

AN ORIGINAL FLOW CHART OF AN OPERATIONAL OIL SPILL-EVENTS AND PRECAUTIONS FOR A STATISTICAL BREAKDOWN OF POLLUTION INCIDENTS BY CAUSES SEE TABLE 2-2
Page 30 , supra

lanes around major ports and straits, poor navigational equipment, awkward handling characteristics of large tankers, and bad judgement and poor training on the part of ship's officers.[28] The poor handling characteristics of modern supertankers which require miles to stop or make a turn are a source of major concern. The rules governing the conduct of vessels in sight of one another so as to avoid collisions were formulated decades ago for smaller, more easily handled vessels.[29] Other factors such as the excessive use of automatic pilots, boredom and inattentiveness induced by long voyages, and other human and technical factors play a role.

The large scale losses resulting from damage to such tankers are said to account for 80 per cent of all oil pollution.[30] While the exact percentages are questionable since all major spills are recorded while hundreds, perhaps thousands, of smaller ones are not, there is no doubt that the elimination of major traumatic oil spills would significantly reduce total vessel-source marine oil pollution. Not only large tankers, but tank barges and other vessels are involved in collisions and groundings. The loss of oil in each instance is not as great but the cumulative burden is considerable.[31] The losses from such accidents accrue not only to the environment but cost of lives and property, and create economic and social burdens. The conservation of scarce oil is desirable in itself. Presumably any measures designed to prevent such traumatic losses would also have the effect of decreasing fatalities and other costs as well.[32]

2:4 ANATOMY OF AN OIL SPILL

Whatever the source of the oil entering the marine environment, it begins its destructive path almost immediately.[33] Depending on its form--crude or refined, slick or emulsion--it is propagated by the wind, waves, current, or by gravity itself [34] without any outside assistance. If in the form of a slick, wave action soon begins to emulsify some portions so that the characteristics of both a slick and an emulsion are present.

The slick is a thick, molasses-like substance, if there is a large amount of crude, or a shimmering rainbow-like glimmer in the case of lighter oils.[35] The emulsion appears a muddy brown and acquired the nickname "chocolate mousse" during the Torrey Canyon disaster.[36]

The lighter fractions of oil, and the most dangerous, soon begin to evaporate into the air, aided by the wind. Some of the oil is actually dissolved by the seawater. Sunlight adds to the process causing a chemical deterioration known as auto-oxidation. The oil is also subjected to biodegradation as it is attacked by bacterial micro-organisms.[37] The process of bio-degradation requires oxygen and will remove dissolved oxygen from the water reducing that available for utilization by marine organisms.[38]

The exact rate at which the oil is affected by the air, sun, water, and bacteria depends on the properties of the particular oil, such as sulphur content, paraffin content, etc., which in turn are a function of the origin of the oil.[39] After a few months (usually about 90 days), only about 15 percent of the oil remains in the form of a dense asphaltic residue about the size and shape of a softball.[40]

2:4:1 ENVIRONMENTAL EFFECTS OF OIL POLLUTION

As the oil spreads over the surface of the water, the toxic fractions kill the larval and adult forms of marine invertebrates and other fragile organisms.[41] The slick and its oily film form a barrier on the surface of the water, interfering with reaeration (the exchange of O_2 and CO_2 between air and water) as well as evaporation, reducing the oxygen and water vapor content of the atmosphere.[42] The oil and its emulsions coat and destroy algae and plankton. Those that survive are severely hampered in photosynthesis and reaeration by the oil covering themselves and the water. The food chain, of which they form the base, is disrupted. Fish entering the slick find their gills clogged with oil and suffocate. Others ingest emulsions and are poisoned. The

flesh of those that survive is tainted by an oily taste which disrupts the local fishing industry. Other species leave the area, altering the ecological balance of the area.[43]

As the thick oil of the slick comes into contact with particulate matter, it sinks to the bottom suffocating benthic life and making further demands on the dissolved oxygen available for life (BOD). As the oil reaches the shore, intertidal organisms die by the thousands as a result of toxicosis and suffocation. Seaweed, kelp, and other sessile life become matted with oil and are easily torn loose from the bottom by wave action. Beach erosion is increased and oxygen production decreased.[44]

Waterfowl seem particularly attracted to oil spills, possibly mistaking them for calm waters in which to land. Their feathers become matted and soaked, causing a loss of buoyancy and drowning. The ingested oil may cause toxicosis and death. The loss of insulation provided by the feathers, or fur in the case of mammals, causes loss of body heat and frequent death from exposure. At the very least, the birds cannot fly and slowly starve to death. Marine mammals such as seals and sea otters suffer similar fates.[45]

Attempts to clean up the spilled oil can have equally damaging effects on the ecosystem. Attempts to burn off the oil remove only the volatile fractions leaving the denser, asphaltic elements still to be dealt with. Additionally, the intense heat burns many organisms and large amounts of air pollution are caused.[46] The use of chemical dispersants was found to be fairly effective at cleaning up the oil, but it was soon realized that in many cases it was more harmful to the environment than the oil. This is particularly true in the case of detergent-base dispersants. Both toxic and non-toxic dispersants seek to further the emulsification process by breaking the oil down into droplets which are more readily attacked by bacteria. Unfortunately, this also results in the oil being more readily absorbed by plankton with the consequent introduction of petroleum hydrocarbons into the food

chain.[47] Dispersants have the advantage of being relatively inexpensive and easily applied, which is why their use is so popular.[48] Another method of removal is by spreading particulate matter (i.e., chalk or sawdust) on the water to absorb the oil and sink it. While this prevents the oil from reaching the beach, the damage to the ecosystem is merely transferred to the bottom. (See page 34 supra)

Oil which has soaked into beaches, particularly tourist beaches, often necessitates the removal of the top few inches of beach with all its life and replacement with sterile bottom sand. While perhaps necessary to preserve tourism, the beach will take months to restore itself ecologically.

One of the most effective and least damaging ways of controlling oil pollution is the use of physical barriers to contain the oil slick. The oil is then removed by suction and disposed of or re-used. The success of this method is highly dependent on such factors as wind and current speed, wave height, weather, etc., as well as the availability of the necessary equipment. Additionally, this is a relatively expensive method of clean-up, requiring sufficient manpower and a large capital investment in booms and appurtenances.[49]

2:4:2 LONG TERM ENVIRONMENTAL EFFECTS OF OIL POLLUTION

In addition to the immediate destruction resulting from an oil spill, the effects may be noticeable for some years and continue in the ecosystem beyond the period when they are measurable by man.[50] Frequently, entire shellfish populations may be wiped out such as that of Narragansett Bay, R.I.[51] If not killed outright, population of organisms may change their habitat, altering the nature of the eco-balance.[52] In a Baja, Mexico spill study, almost all marine life was killed or fled. It was almost two years before a significant number of species returned. Some had not returned after ten years.[53] There have also been increasing reports of skin ulcerations, cancerous lesions,

tail deformities, and leukemia in fish living in oil spill areas.[54]

There are also less noticeable effects. The petroleum hydrocarbons are bioaccumulated by filter feeders[55] and retained for long periods of time. These accumulations may be consumed directly by man or enter the food chain through consumption by other organisms. Recent studies have shown that 3-4 benzopyrene, a known carcinogen, may be absorbed by shellfish in this manner and is suspected of being connected with oil pollution.[56] The oil may also be absorbed by plankton which in turn is consumed by creatures higher in the food chain until ultimate consumption by man.[57] Man, therefore, may be the ultimate victim of this bioaccumulation of petroleum hydrocarbons. Although not conclusively proven, there may be a relationship between cancer in man and consumption of oil polluted marine life.[58]

Other possible effects of such pollution on marine organisms may include genetic defects interference with sensing mechanisms and food seeking mechanisms, inability on the part of some species to home on their spawning grounds, and interference with sexual reproduction.[59]

2:4:3 ECONOMIC EFFECTS OF AN OIL SPILL

While the massive destruction of marine organisms, fish and wildlife, as well as disruption of the ecosystem, is not always calcuable in terms of dollars and cents, there are many costs, both direct and indirect, which are calcuable and may be more meaningful to those who are not vitally concerned with the environment.

One of the greatest and most obvious costs is the highly expensive clean-up operation following the spill. For private citizens, this will mean cleaning bills for boats, private beaches, and piers. Rugs, smeared by oil tracked in by the curious, must be cleaned in homes and business establishments as well as the shoes themselves. Frequently, children or swimmers inadvertently find themselves immersed in the oil followed by a long and painful removal from their bodies by solvents.

The public sector (i.e. the taxpayers) will bear the cost of cleaning up beaches, boardwalks, public docks, rocks and shorelines as well as the water itself. Dead fish and waterfowl must be gathered up and buried. Frequently, the beaches must be bulldozed and new sand trucked in as a replacement. Clean-up costs range from $10 a gallon for small spills[60] to $1-5 per gallon for larger spills. The actual costs vary according to the method employed, type of oil, area of spill, nature of the coastline and other factors.[61] Such variations result in little consistency in reported clean-up costs so as to be able to form a basis for prediction. One spill of 5,000 gallons cost $20,000 to remove, whereas another spill of 40,000 gallons was cleaned up at a cost of $86,246.[63] The efficiency of the clean-up organization is a big factor in costs and aggregate costs will no doubt decrease as experience, expertise and clean-up technology improves. These costs are recoverable only where the source of the pollution can be traced and liability asserted under convential theories.

Other direct costs include losses to local fishing and shellfish industries, not only as a result of damage to nets, boats and other gear, but in decline in the overall catch. Shellfish beds closed by pollution already cost this nation $63 million annually.[64] Lost profits to local hotel and tourist industries may result from closure of oil polluted beaches and recreational facilities. It has been estimated that a serious spill during the summer months could cause lost tourist profits amounting to $30 million in the New York area or $51 million in the Los Angeles area.[65]

There are also indirect costs: large amounts of capital and manpower tied up in pollution clean-up which have been diverted from more productive areas, increased taxes to pay for a large pollution clean-up organization, research costs, and the cost of the oil itself as well as its loss to an economy already suffering from shortages.

As injured parties seek recovery for their losses, other costs arise in the form of attorney's fees, litigation expenses, and jammed court schedules.[66] There are also social costs such as lost time, frustration, jobs lost in the tourist industry, and attendant unemployment and welfare costs. Even protection against such losses creates costs in the form of insurance premiums and the cost of maintaining a pollution prevention establishment.

2:5 PATTERNS OF POLLUTION

One of the most unfortunate aspects of oil spills is that they occur most frequently in areas where they are likely to do the greatest harm. While oil is a harmful substance anywhere in the marine ecosystem, the majority of oil spills of all types, traumatic and operational, occur within the coastal zone. The coastal zone is one of the most fertile areas in the entire world ecosystem. It's waters, shores, beaches, and bottoms literally teem with life forms of all kinds. These millions of animals, plants and other forms of marine life exist in an exceedingly complex and delicately balanced system which is extremely vulnerable to the threat presented by oil. This abundant productivity holds great promise for easing the world's chronic protein shortage. However, unless the coastal ecosystem is protected from destruction by oil and other forms of pollution, this promise will remain unfulfilled.[67]

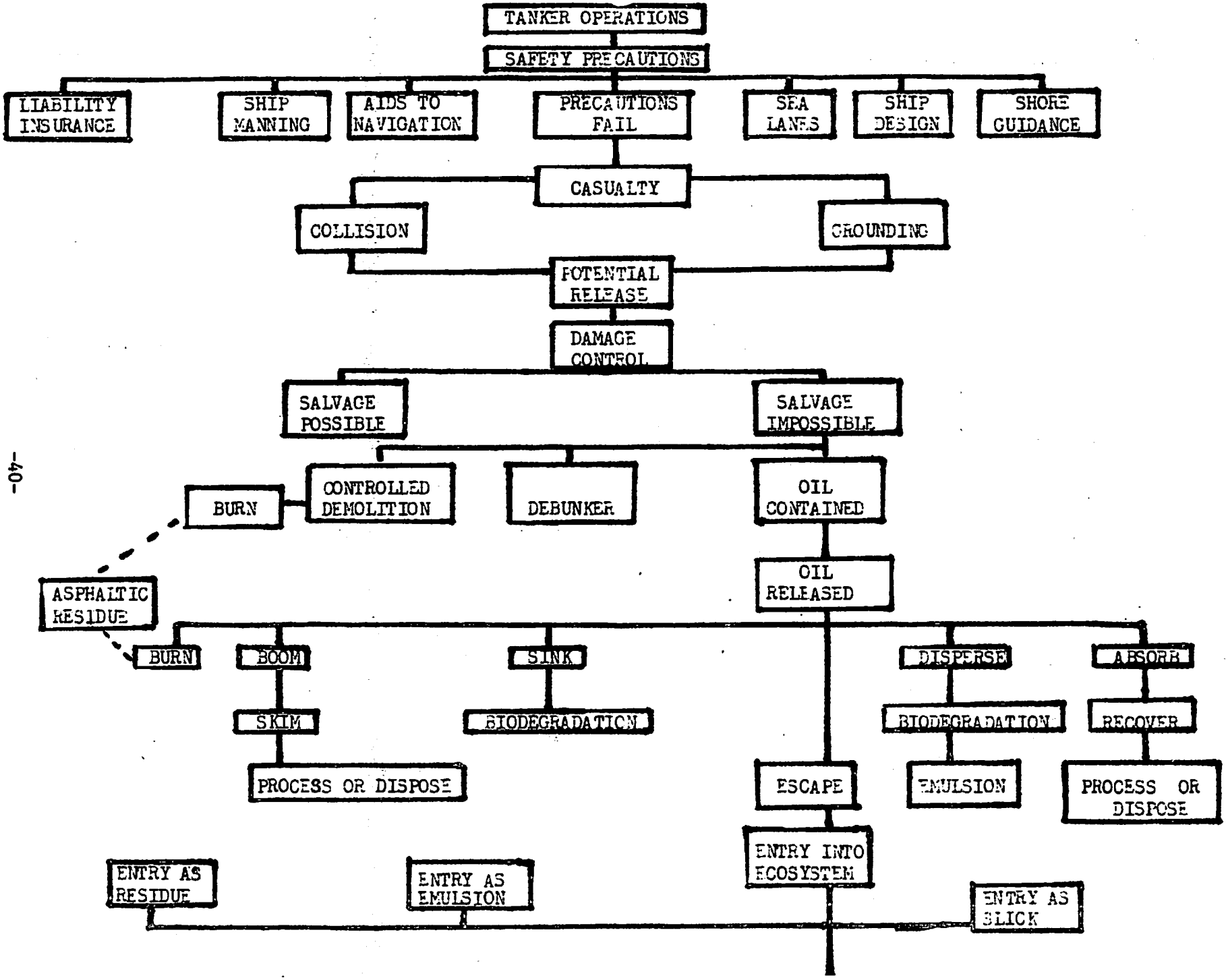
The figures in Table 2-5 on page 86, infra, show that the greatest amount of pollution, both in terms of incidents and volume, occurs in the coastal zone. A great deal of this pollution seems to occur in areas associated with vessel activity such as terminals, docks and ports. Only about 11 percent of the pollution reported is attributed to the high seas, but lack of a comprehensive reporting system covering that area makes these figures indicative only of reported occurrences.

The U.S. Petroleum Council estimates that 75 percent of all major oil spills are caused by vessels with only 5 percent caused by offshore

drilling activity. Over 70 percent of these spills are over 5,000 barrels and 90 percent of the oil spilled is crude and residual oils. Almost 80 percent of these spills occur less than ten miles from shore. Particularly interesting is the fact that 75 percent occur within 25 miles of a port. The great possibility of major economic loss is indicated by the fact that 85 percent occur off a recreational area. This is particularly true in light of the figures discussed on page 37, supra.

The pattern that emerges from this study is that not only is the coastal zone suffering heavily from oil pollution, but the coastlines and recreational areas around major ports are particularly hard hit. This premise is borne out by reports from other sources. Alaska reports that at least 10,000 waterfowl have been killed in the approaches to Kodiak Island by tankers deballasting as they come in to load.[69] Reports from Newfoundland indicate that more than 1,000 penguin-like murre are killed each day by oil pollution resulting from tankers flushing their tanks off the southeast coast of that area.[70]

Not all oil pollution remains in the coastal zone. Horizontal and vertical ocean currents transport the pollution and its effects throughout the world. Some scientists estimate that the world's oceans as a whole have already lost 30 to 50 percent of their vitality.[71] The asphaltic tar balls left as residue after the weathering of a spill litter the entire ocean. NOAA scientists recently reported that vast areas of the Atlantic from Cape Cod to the Carribean are covered by oil and tar balls. The heaviest concentrations were found in the Carribbean off the Antilles. These waters were 80-90 percent contaminated with pollution originating in the heavily travelled tanker lanes off the west coast of Africa and carried there by ocean currents. Half the plankton samples taken were contaminated by oil. An estimated 87,000 tons of these tar balls are added to the world's oceans each year.[72] Such findings present a clear pattern of pollution


TANKER OPERATIONS
SAFETY PRECAUTIONS
LIABILITY INSURANCE
SHIP MANNING
AIDS TO NAVIGATION
PRECAUTIONS FAIL
SEA LANES
SHIP DESIGN
SHORE GUIDANCE
CASUALTY
COLLISION
GROUNDING
POTENTIAL RELEASE
DAMAGE CONTROL
SALVAGE POSSIBLE
SALVAGE IMPOSSIBLE
BURN
CONTROLLED DEMOLITION
DEBUNKER
OIL CONTAINED
OIL RELEASED
ASPHALTIC RESIDUE
BURN
BOOM
SINK
DISPERSE
ABSORB
SKIM
BIODEGRADATION
BIODEGRADATION
RECOVER
PROCESS OR DISPOSE
ESCAPE
EMULSION
PROCESS OR DISPOSE
ENTRY INTO ECOSYSTEM
ENTRY AS RESIDUE
ENTRY AS EMULSION
ENTRY AS SLICK

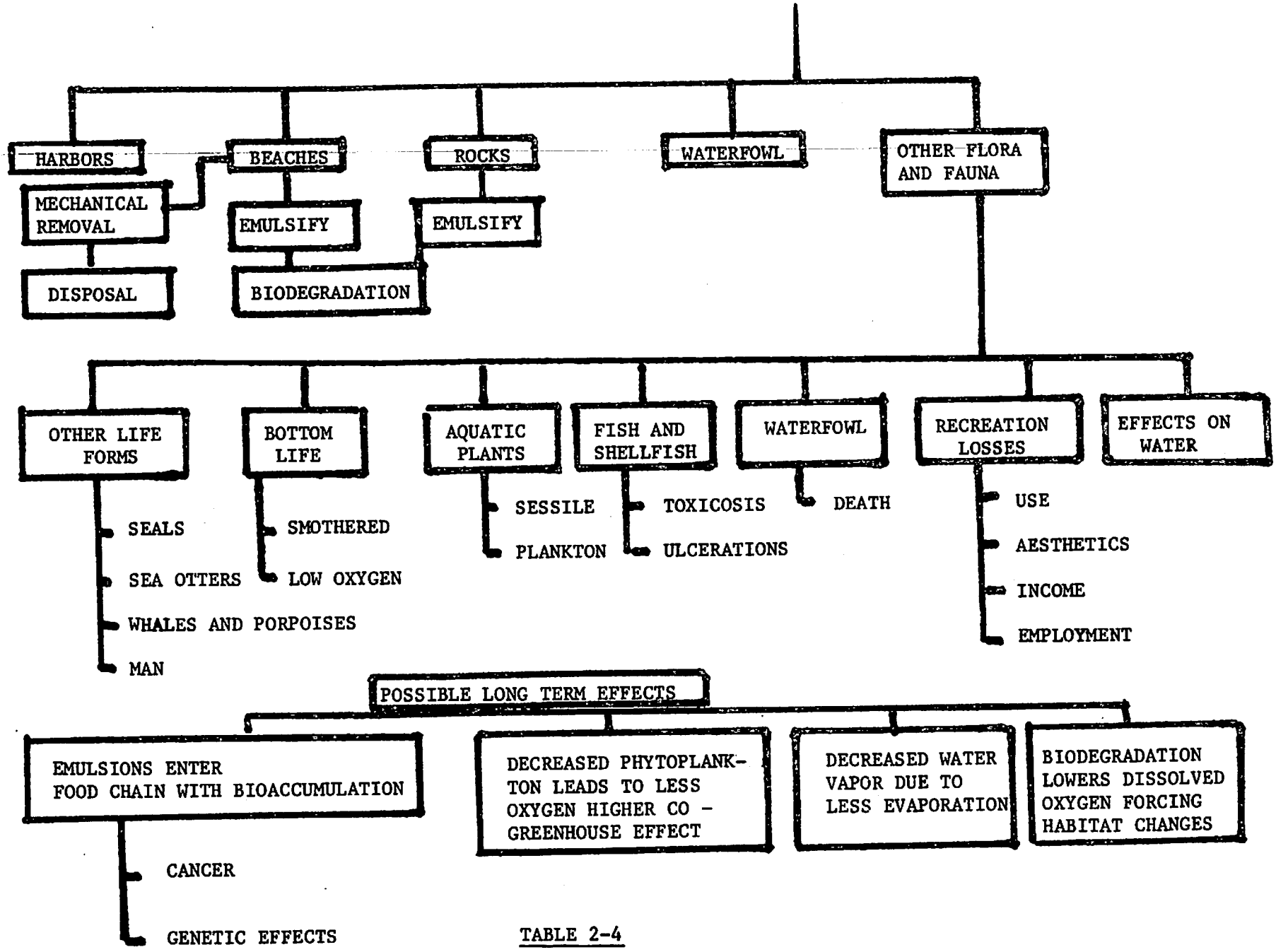


TABLE 2-4

FLOW CHART OF A TRAUMATIC OIL SPILL-EVENTS AND CONSE-QUENCES BASED ON A SIMILAR CHART IN Swift, Touhill, Templeton, & Roseman, Oil Spillage Prevention, Control and Restoration, in OIL POLLUTION: PROBLEMS AND POLICIES 31, 36 (S. Degler ed. 1969).

TABLE 2-5

STATISTICAL BREAKDOWN OF
POLLUTION INCIDENTS BY LOCATION

LOCATION	NUMBER OF INCIDENTS	% OF TOTAL	VOLUME IN GALLONS	% OF TOTAL
INLAND WATERS				
1. Roadsteads	16	0.2	4,983	.05
2. Ports	37	0.4	9,044	0.1
3. Terminals & Docks	164	1.7	52,402	0.3
4. Beaches	3	---	219	---
5. River areas	340	3.4	1,793,864	9.5
6. Non-navigable	122	1.2	410,259	2.2
TOTAL	682	6.9	2,270,771	12.1
COASTAL WATERS (Including Great Lakes)				
1. Bays, estuaries, etc.	2,237	22.5	368,412	2.0
2. Ports	1,504	15.1	414,339.	2.2
3. Terminals & Docks	1,622	16.3	1,655,113	8.8
4. Beaches	98	1.0	78,477	0.4
5. Canals & Inlets	656	6.6	1,136,668	6.0
6. River areas	1,260	12.7	10,346,826	55.0
7. Non-navigable	65	0.6	277,840	1.5
8. Open Waters (Great Lakes & Territorial sea)	423	4.3	24,681	0.1
TOTAL	7,864	79.1	14,302,056	76.0
CONTIGUOUS ZONE	801	8.1	34,793	0.2
HIGH SEAS	583	5.9	2,197,812	11.7

Figures from U. S. COAST GUARD, POLLUTING INCIDENTS IN AND AROUND U. S. WATERS: CALENDAR YEAR 1972 4 (1973).

on a global scale. The pollution of the Carribbean by Arab oil dumped off Africa by the tankers of possibly yet another nation point up the international complexities of the problem.

An examination of Table 2-6 on page 44, infra, reveals the patterns and density of world tanker traffic.[73] It is clear that many of the world'd most prolific coastal zones are threatened by tanker related oil pollution. This is particularly true of such areas as the Meditterranean and Baltic which have poor flushing characteristics and cannot rid themselves of the pollution. The world's oceans have no where to flush their wastes and non-degradable pollution is there to stay.[74] The valuable areas of the Carribbean, East Indies and Indian Ocean, all have heavy tanker traffic and the entire continent of Africa is ringed by densely travelled routes. A comparison of Table 2-6 with Table 2-7 on page 45, showing the prevailing ocean currents, illustrates the manner in which the tanker lanes are swept by currents which distribute the oil discharged there throughout the world.

2:6 SUMMARY

This chapter has discussed the nature, causes, and effects of oil pollution of the marine ecosystem. Oil pollution is a severe threat to the marine environment of the entire world with the possibility of severe secondary effects on man and the global ecology. Unless this threat is averted, unforseeable consequences may result.

It appears from the figures examined that one of the major threats to the marine environment is oil pollution of the coastal ecosystem. One of the chief causes of this pollution is vessel traffic, particularly tankers, and the discharge of oil through traumatic and operational causes.

Because oil is highly important industrial commodity, there are no easy answers to the oil pollution problem. In addition to an understanding of the ecological aspects of the problem, the legal and economic context must be examined as well. In the next chapters, an attempt will be made

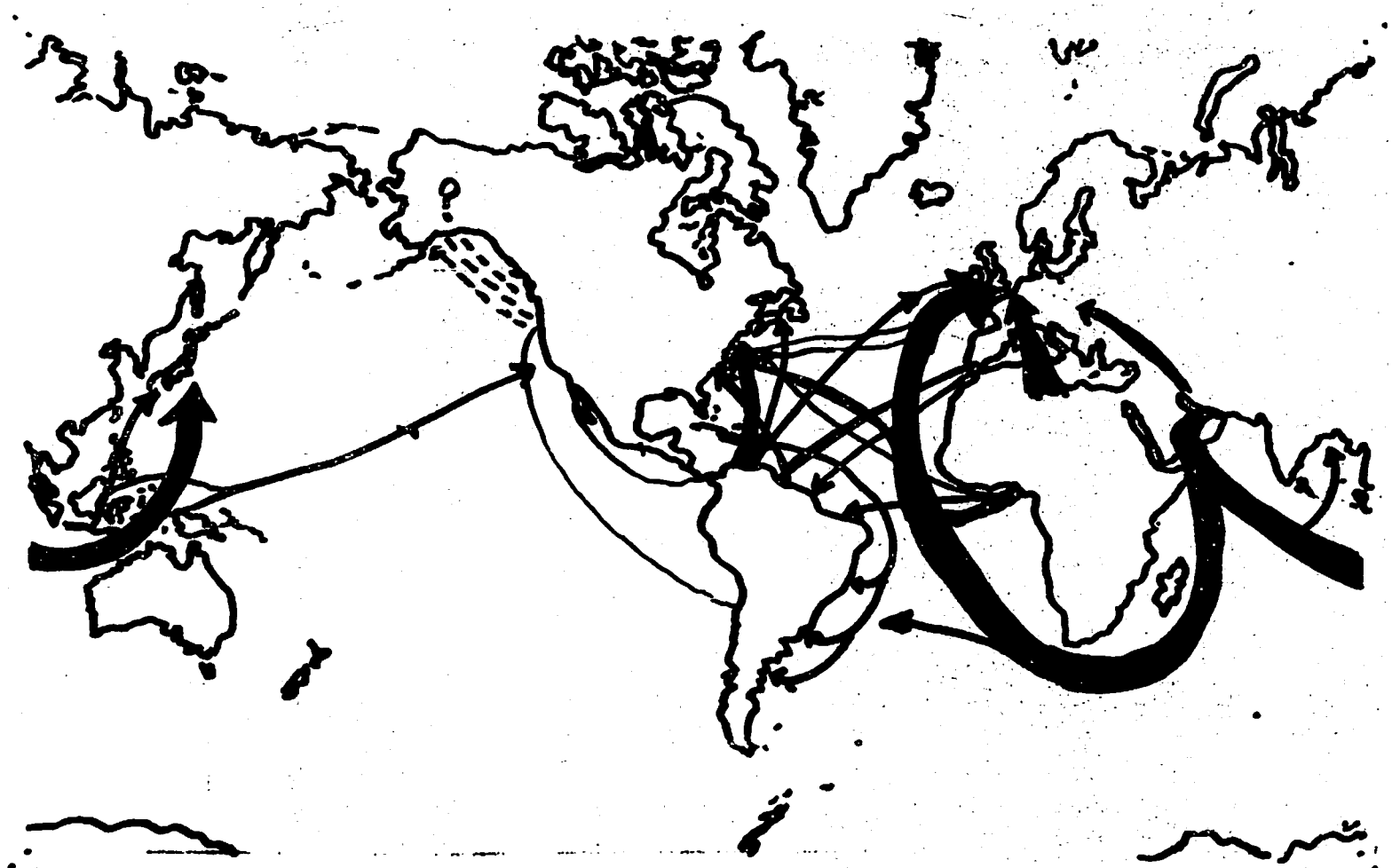


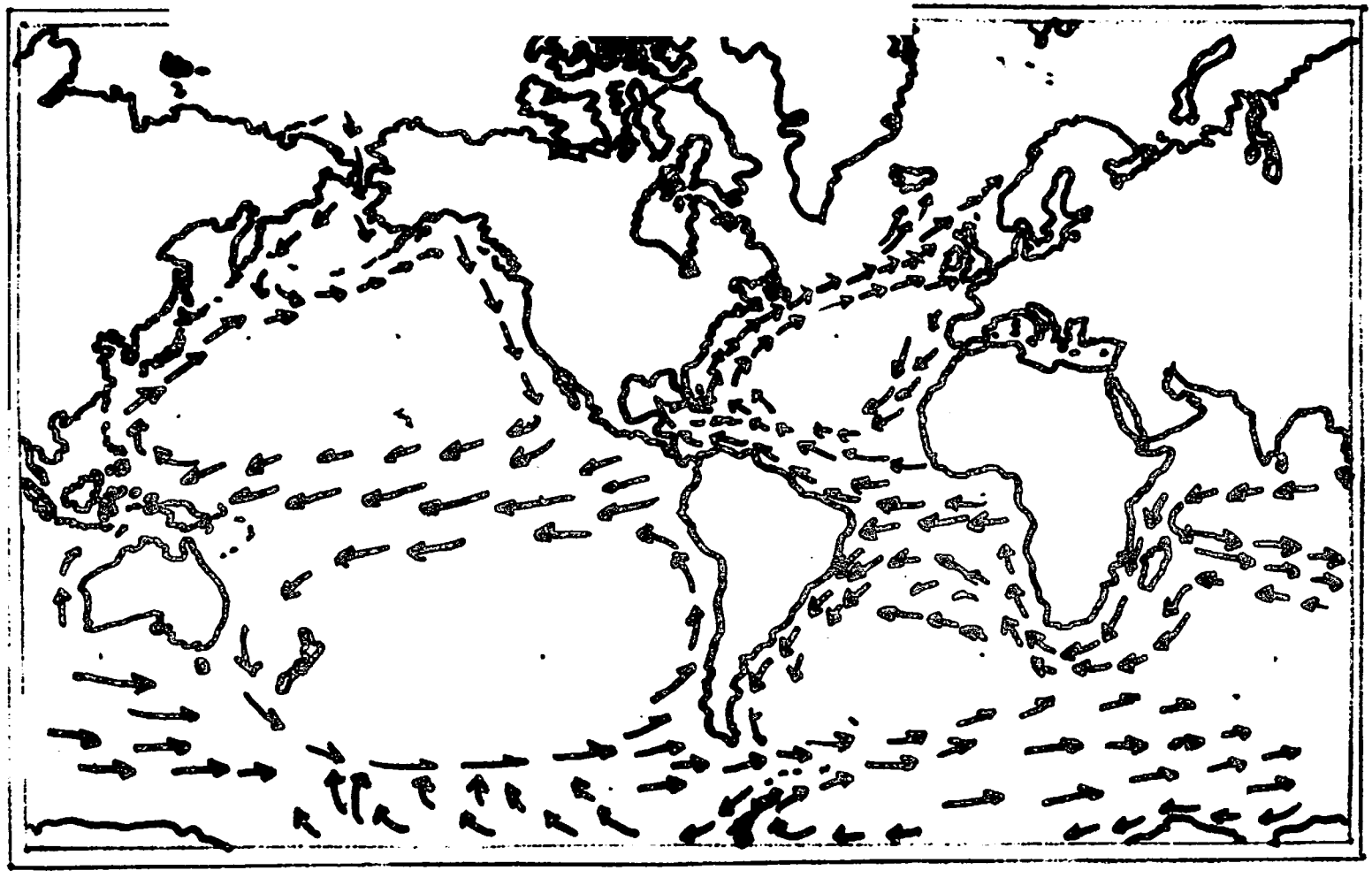
TABLE 2-6

WORLD TANKER TRAFFIC AND ROUTES-RELATIVE DENSITY
OF TRAFFIC AS A FUNCTION OF LINE THICKNESS

Based on a table appearin in Bates & Yost, Where Trends the Flow of Merchants Ships ? see footnote 73

figure 2-7

PREVAILING WORLD OCEAN CURRENTS



to examine the oil transportation industry and some of the factors affecting international efforts to prevent oil pollution. The international legal background and applicable legal principles will also be discussed.

FOOTNOTES CHAPTER II

1. Although there was some concern at the turn of the century, the problem reached major proportions following WW I, resulting in the calling on an unsuccessful international conference to deal with it in Washington, D.C. in 1925.

2. The Torrey Canyon disaster presents an excellent example of the international aspects of the oil pollution problem. The Torrey Canyon, a large crude oil carrier, ran aground in the English Channel, spilling its cargo onto English and French beaches. The ship was owned by a Bermuda subsidiary of an American oil company. It was on long term charter to that company and on a voyage charter to a British oil company. It was carrying oil from Kuwait, was registered in Liberia, and manned and operated by Italians. see, E. COWAN, OIL AND WATER: THE "TORREY CANYON" DISASTER 23 (1968).

3. For an excellent discussion of the remedies for oil pollution damage and the principles of liability therefore, see Post, A Solution to the Problem of Private Compensation in Oil Discharge Situations, 28 U. MIAMI L. REV. 524 (1974); Mendelsohn, Maritime Liability for Oil Pollution - Domestic and International Law, 38 GEO. WASH. L. REV. 1 (1969); Pearson, Admiralty Remedies for Vessel Oil Pollution of Navigable Waters, 7 TEX. INT. L. J. 121 (1971).

4. M. Blumer, Oil Pollution of the Ocean, in OIL ON THE SEA 5, 7 (D. Hoult ed. 1969) (hereinafter cited as Pollution of the Ocean).

5. M. Hardy, Definition and Forms of Marine Pollution, in 3 NEW DIRECTIONS IN THE LAW OF THE SEA 73, 74 (S. Lay ed. 1973).

6. Most oil pollution figures are only estimates based on an extrapolation of known losses to total petroleum activity. Many sources of pollution, such as recreational boats, raincarried runoff from roads, etc. can not be accurately estimated. One of the few organized reporting systems is that of the U. S. Coast Guard which has only

been in operation for a few years. Coast Guard figures are actually only a minimum of the pollution since they consist only of spills actually reported or detected. References in some works to increasing annual spillage figures fail to take into account that much of the increase may be attributed to an increase in reports under recent statuatory requirements to report such spills rather than to an actual increase in spills. U. S. COAST GUARD, POLLUTING INCIDENTS IN AND AROUND U. S. WATERS: CALENDAR YEAR 1972 2 (1973) (hereinafter cited as Polluting Incidents). Oil pollution figures, therefore have their chief value as estimates of relative contributions from various sources. Since the figures are only estimates and subject to many inherent inaccuracies, the figures from various years may be used concurrently without difficulty.

7. Hardy, Offshore Development & Marine Pollution, 1 OCEAN DEV. & INT. L. J. 239, 242 (1973).

8. Out of the 5,000,000 gallons of motor oil used in this country every year, only about 1,500,000 gals. are reclaimed. The other 3,500,000 are disposed of via sewers. The reclamation of such oil has been discouraged by federal tax and labelling provisions. Tax incentives and other measures are needed to encourage the use of reclaimed oil both as an environmental measure and for energy conservation. This figure of 3,500,000 gals. is for the U.S. only and extended to world use of motor oil would no doubt run into BILLIONS of gallons of crankcase oil finding their way into world waters every year. SECRETARIES OF INTERIOR & TRANSPORTATION, A REPORT TO THE PRESIDENT ON POLLUTION OF THENATION'S WATER BY OIL AND OTHER HAZARDOUS SUBSTANCES 6 (1968) appears as Oil Pollution: A Report to the President, in OIL POLLUTION PROBLEMS AND POLICIES 62, 70 (S. Degler ed. 1969) (hereinafter the report will be cited to the article as Secretaries Report, the main work will be cited as Degler).

9. Natural disasters often contribute to the oil pollution problem by washing oil from roads, dumps, and storage lagoons. Tropical Storm Agnes released 6,000,000 gals. of waste oil in this manner in June, 1972. The New York Times, July 2, 1972, at 57, col. 2.

10. An estimated 100 sq. miles of the floor of New York Harbor and Long Island Sound have been destroyed by the accumulation of these small spills. Andelman, Oil Pollution: The Menace of the Mini-Spills, The New York Times, Jan. 23, 1972, § IV at 2, col. 5.

11. Blumer, Submarine Seeps, Are They A Major Source of Open Ocean Pollution?, 176 SCI. AM. 1253 (1972).

12. Hearings on H. R. 6495, H. R. 6609, H. R. 6744 and H. R. 7325, Before the House Committee on the Merchant Marine and Fisheries, 91st Cong., 1st Sess. Ser. 91, pt. 4, at 119 (hereinafter cited as Hearings) See also, Secretaries Report at 72, note 8, supra.

13. M. SCHWARTZ & E. RABIN, THE POLLUTION CRISIS: OFFICAL DOCUMENTS 55 (1972) (hereinafter cited as Pollution Crisis).

14. R. Holmes, The Santa Barbara Oil Spill, in OIL ON THE SEA 15, 21 (D. Hoult ed. 1969) (hereinafter the main work will be cited as Hoult).

15. See Table 2-1, page 26 Offshore Oil Drilling is thought to account for less than 2% of total marine pollution. Hardy, Offshore Development & Marine Pollution, 1 OCEAN DEV. & INT. L. J. 239, 242 (1973).

16. R. SHINN, THE INTERNATIONAL POLITICS OF MARINE POLLUTION CONTROL 14 (1974)(hereinafter cited as Shinn).

17. See text accompanying note I-19 supra.

18. Pollution of the Ocean at 7, see note 4 supra.

19. The Coast Guard reports that 35 to 40% of oil pollution of navigable waters is caused by tankers and transfer operations. The New York Times, Mar. 28, 1972, at 85, col. 1 see also Table 2-1, page 26.

20. New "load on top" systems and slop tanks will supposedly reduce such discharges by 99%, if used properly. All new tankers will allegedly have such systems as well as 70-80% of old tankers. Comment, Oil Pollution of the Sea, 10 HARV. INT. L. J. 316, 357 (1969).

21. At this point, an explanation of the various measures used in the marine oil transportation industry is offered for those unfamiliar with them. Oil quantities are usually measured in barrels (bbl.) of 42 gallons or in metric tons of 2204.6 lbs. The number of gallons in a ton varies from 240 to 300 depending on the temperature and vicosity of the oil. Meiklejohn, Liability for Oil Pollution Clean-up and the Water Quality Improvement Act of 1970, 55 CORNELL 973, n. 78 at 982 (1970). The capacity of tankers may be measured in deadweight tons (DWT) or gross registered tons (GRT). DWT is the capacity of the tanker measured by the difference in displacement

loaded and unloaded and is measured in long tons of 2240 lbs. GRT is a measure of the internal capacity or volume of the tanker measured in tons of 100 cubic feet. A. KNIGHT, MODERN SEAMANSHIP at 42-43, (13th ed. 1960).

22. Secretaries Report at 70, see note 8 supra.

23. Ballasting or the taking on of sea water into empty tanks, is necessary to preserve the stability of a vessel designed to operate with these tanks full. Without this ballast, tankers are very unstable. For this reason, tanker captains are reluctant to deballast until the last moment possible. Consequently, the areas in the vicinity of the loading facility suffer particularly heavy damage. An estimated 10,000 waterfowl have been killed in Alaska in such a manner. Pollution Crisis at 55, note 13 supra.

24. Secretaries Report at 70.

25. See Table 2-2, page 30.

26. In particular, the grounding of the Torrey Canyon in the English Channel in 1967 and that of the Ocean Eagle off San Juan Harbor, P. R. in 1968. J. Ludwigson, Oil Pollution at Sea, in Degler at 2, 6, note 8 supra.

27. This is exactly what occurred when an engineer aboard a U. S. aircraft carrier turned the wrong valve, dumping 3,000 gallons of diesel oil on the French Riviera at the height of the tourist season. W. MARX, THE FRAIL OCEAN 65 (1967).

28. Collisions are much more frequent than is thought. One vessel in 14 is in collision with another vessel each year. Deficiencies in licensing requirements for seamanship and proficiency are one of the primary focuses of the flag of convenience dispute. C. Warbick, The Regulation of Navigation, in 3 NEW DIRECTIONS IN THE LAW OF THE SEA 137, 142 (S. Lay ed. 1973) (hereinafter the main work will be cited as New Directions).

29. They were originally promulgated in the mid-19th century by individual nations and binding only on their vessels until they achieved the status of customary international law. see, The Scotia 81 U. S. (14 Wall.) 170 (1871).

30. B. LEFF, SEABED REGIMES AND THE LIMITS OF NATIONAL JURISDICTION 80 (1972).

31. According to Coast Guard figures, collisions and groundings

spill an average of 228 million gallons of pollutants in U. S. waters each year and take an average of 50 lives. R. Hill, Collisions and Groundings, Preventing the Unpreventable, U. S. NAVAL INST. PROC. 45 (Dec. 1974) To gain some idea of the frequency and magnitude of such incidents, examine one year's news reports as gathered in the NEW YORK TIMES INDEX under Water Pollution-Oil (petroleum) and Gasoline.

32. Coast Guard efforts to reduce ship collisions and groundings are based on an effort to protect lives and property as well as the environment. Most measures have the effect of protecting all three. A comprehensive program of collision prevention is now underway. see, Hill note 31, supra.

33. Gallon for gallon, oil is considered the most destructive of all persistent pollutants and is found in the largest quantities. Shinn at 6, note 16, supra.

34. J. Fay, The Spread of Oil Slicks on a Calm Sea, in Hoult at 53, 54, note 14, supra. This essay includes an excellent discussion of the technical aspects of oil slick propagation. The spreading is caused by the lighter fractions of the oil seeking a constant level.

35. See photos at pages 16-17 in R. Holmes, The Santa Barbara Oil Spill, in Hoult, note 14, supra.

36. R. Dean, The Chemistry of Crude Oils in Relation to Their Spillage on the Sea, in Hearings at 288, note 12, supra (hereinafter cited as Dean).

37. Dean at 288.

38. Shinn at 10, note 16, supra. The deleterious effects of this high oxygen demand are particularly pronounced when environmental parameters are already marginal due to pollution from other sources. W. Swift, C. Touhill, W. Templeton & D. Roseman, Oil Spillage Prevention, Control, and Restoration - The State of the Art and Research Needs, (hereinafter cited as Oil Spillage Prevention) in Degler at 31, 44, note 9, supra; COUNCIL OF ENVIRONMENTAL QUALITY, A REPORT TO THE PRESIDENT, OCEAN-DUMPING: A NATIONAL POLICY n 16 at 14 (1970).

39. Dean at 285-6, These various characteristics also aid in the detection and tracing of the source of the spill through the use of spectrographic analysis. Andelman, Coast Guard Sleuth Traces Sea Polluters, The New York Times, Jan. 18, 1972 at 62, col. 1.

40. Pearson, Admiralty Remedies for Vessel Oil Pollution of Navigable Waters, 7 TEX. INT. L. J. 121, n 14 at 123 (1971).

41. Secretaries Report at 66, note 8, supra.

42. Pomeroy, The Ocean's Food Web, A Changing Paradigm, 24 BIO. SCI. 449, 87 (1974). Some scientists predict that the large amount of oil in the ocean will lead to reduced evaporation, less world rainfall and eventual drought in many areas. See text accompanying note I-13 supra.

43. Secretaries Report at 65, COUNCIL OF ENVIRONMENTAL QUALITY, A REPORT TO THE PRESIDENT, OCEAN-DUMPING: A NATIONAL POLICY 12-17 (1970) (hereinafter cited as Ocean Dumping).

44. Waldichuk, Coastal Marine Pollution and Fish, 2 OCEAN MANAGEMENT 1, 41 (1974).

45. Secretaries Report at 65.

46. R. WAGNER, ENVIRONMENT AND MAN 166 (1971); see also P. Tully, Removal of Floating Oil Slicks by the Controlled Combustion Technique, in Hoult at 81, note 14 supra

47. Oil Pollution of the Ocean at 10-11, note 4, supra.

48. see generally, G. Canevari, The Role of Chemical Dispersants in Oil Clean-up, in Hoult at 29.

49. see generally, D. Hoult, Containment and Collection Devices for Oil Slicks, in Hoult at 65, note 14, supra; Oil Spillage Prevention at 40-1, note 38, supra.

50. A detailed study of the effects of a small spill of about 660 tons has been ongoing since it occurrence in 1969. The study showed 95% death rates for bottom life. Lobsters and bottom living fish suffered heavily. The area has not only been slow to recover, but the effects of the spill are still spreading. THE WATER'S EDGE 118 (B. Ketchum ed. 1973).

51. Post, Private Compensation for Injuries Sustained by the Discharge of Oil from Vessels on the Navigable Waters of the United States; A Survey, 4 J. MAR. LAW & COMMERCE 25, 29 (1973).

52. Ocean Dumping at 12, note 43, supra.

53. Holcomb, Oil in the Ecosystem, 166 SCIENCE 204, 205 (1969).

54. Shinn at 10, note 16, supra.

55. Organism such as shellfish.

56. Waldichuk, Coastal Marine Pollution and Fish, 2 OCEAN MANAGEMENT 1, 41 (1974); Holcomb, Oil in the Ecosystem, 166 SCIENCE 204, 205 (1969).

57. To gain some idea of the food chain and the accumulation of pollutants, consider the following: 1,000 lbs. of phytoplankton feed 100 lbs. of zooplankton or shellfish which in turn feed 50 lbs. of anchovies or small fish. These are consumed by 10 lbs. of small carnivores which are eaten by 1 lb. of the carnivore consumed by man. The 1 lb. of fish eaten by man contains essentially the same pollutants as the 1,000 lbs. of plankton. Pollution Crisis at 120, note 13, supra.

58. Pollution Crisis at 124.

59. Shinn at 10, note 16, supra.

60. The New York Times, June 13, 1972, at 86, col. 2.

61. Meiklejohn, Liability for Oil Pollution Cleanup and the Water Quality Improvement Act of 1970, 55 CORNELL 973, n 78 at 982. The figures are based on a study by the Federal Water Pollution Control Administration.

62. The New York Times, Mar. 4, 1972, at 54, col. 6.

63. The New York Times, May 21, 1972, at 56, col. 1.

64. Pearson, Admiralty Remedies for Vessel Oil Pollution of Navigable Waters, 7 TEX. INT'L. J. 121, 142 (1971).

65. Secretaries Report at 67, note 8, supra.

66. see note 3, supra.

67. While not a total solution to the world food problem, the farming of the seas can substantially contribute to the world's protein supply. In addition to almost a billion tons of fish available on an annual basis, intensive "aquaculture" operations can produce high yields of krill, crayfish, catfish and other organisms. The Japanese have succeeded in producing 23 tons of oyster meat per acre per year, which exceeds by far the productivity of any other area or food source. Marx, The Oceans are Vastly Overrated As A Source of Food and Fuel, SMITHSONIAN June 1974, page 28; a typical wheat field produces 1.5 tons per acre per year; whereas a

typical acre of coastal marsh produces 10 tons per acre per year. R. WAGNER, ENVIRONMENT AND MAN 152 (1971).

68. U. S. Petroleum Council, Environmental Conservation; The Oil and Gas Industries, Vol. II, p. 241, fig. 59, p. 242, table 32, page 249 from C. Fleischer, Pollution From Seaborne Sources, in New Directions, at 78, note 28, supra.

69. Pollution Crisis at 55, note 13, supra.

70. W. MARX, THE FRAIL OCEAN 167 (1967).

71. Dying Oceans, Poisoned Seas, TIME, Nov. 8, 1971, at 74.

72. R. Lyons, Chemical Debris Fouling Atlantic, The New York Times, Feb. 13, 1973, at 22, col. 1; J. Knauss, Ocean Pollution: Status and Prognostication, in THE LAW OF THE SEA: THE EMERGING REGIME OF THE OCEANS 313, 329 (J. Gamble ed. 1973) (hereinafter cited as Knauss, main work cited as LOS).

73. Bates & Yost, Where Trends the Flow of Merchant Ships?, in LOS at 249, 262.

74. Knauss at 325.

CHAPTER III

THE ECONOMIC AND POLITICAL CONTEXT OF THE OIL POLLUTION PROBLEM TODAY

3:1 THE MARINE TRANSPORTATION INDUSTRY

The economic and political factors affecting international efforts to control vessel-source oil pollution cannot be discussed separately. They are so intertwined that to discuss one is to discuss the other. The large oil companies, always influential, now have economic and political power of vast proportions. Oil has become such a tool of foreign policy that any discussion of the subject, even of peripheral issues such as pollution, necessarily imports into the discussion all the political issues of the Middle East and Third World politics.

The story of the maritime transportation of oil is frequently one of vertical integration par excellence. While many tankers are owned by shipping lines and individuals such as Niarchos and Onassis, many of the newest and largest tankers are "owned" by the major oil companies. This enables these companies to control the flow of petroleum from the Persian Gulf well-head, throughout the transportation and refinery phase, and even, in some cases, into the tank of the user. The tankers are not owned outright by the oil companies. For tax purposes, among other reasons, the tankers are actually owned by a separate corporation, usually with a foreign charter and wholly owned by the oil company, which in turn charters the tanker to the oil company on a long term basis such as twenty years. Such an arrangement allows the oil company most of the benefits of ownership without many of the liabilities.[1] Such an arrangement also makes it exceedingly difficult to track the owner of the vessel and assert liability in the case of an oil spill. The very common practice of sub-chartering and sub-chartering still again, makes the assessment of liability all the more difficult.[2]

To avoid labor problems, many tankers are operated by professional shipping agents and manned by foreign crews. This avoids not only the use of the higher cost American seamen but also avoids labor legislation and safety regulations as well.[3] Safety regulations are avoided by registering the tanker in a so-called "flag of convenience" country which offers not only tax advantages[4] and other economic advantages, but assures the vessel owners of a minimum of government interference with the operation of the tanker.[5] The safety records of such "flag of convenience" countries has been documented as very poor. Liberian vessels, even though generally new and operating in less congested waters than the average world merchant vessels, are lost at twice the average world casualty rate and Panamanian vessels at three times that figure.[6]

The oil companies, both in their role as purveyors of oil and as ship operators, have frequently resisted any attempts to increase their liability[7] or, in the alternative, assert that they are the best equipped to deal with the problem.[8] While public opposition to anti-pollution measures will not be undertaken in light of the intense public feeling on this issue, oil industry officials can be expected to continue to oppose any stringent anti-oil pollution measures from behind the political scene. This is particularly true of any direct economic burdens on the transportation of oil, such as user taxes, or new regulations requiring the installation of expensive equipment on older vessels. On the other hand, they can be expected to support safety programs, such as aids to navigation which lower the risk of oil transportation and hence lower their liability and hull insurance premiums.

The marine insurance industry plays a major role in the formulation of maritime policy in all sectors of the industry. Large investors would not risk a capital investment the size of a super tanker unless they had a means of insuring themselves against loss. In exchange

for this protection, they pay over $2,500,000,000 in insurance premiums annually.[9] Such premiums are a cost of doing business and measures which raise liability possibilities raise prices throughout the industrial and consumer sectors as well. Maritime insurance interests themselves can be expected to oppose measures which increase liability potential in spite of the higher premiums which it will bring them. A change in excess liability standards upsets the historical risk analysis calculations and places them almost in the position of "gambling" in the literal sense rather than the figurative. The ever increasing value of ships has also increased the possible loss for any given accident. Industry analysts warn that capital available for insuring maritime risks may not be able to stand the exposure of multi-hundred million dollar-ships coupled with increased liability standards.[10] Nevertheless, there seems to be a distinct trend toward the imposition of strict or absolute liability for oil pollution on vessel owners, and protagonists of such proposals must consider the possibility that no insurance would be available to pay judgments no matter how obtained.[11]

Maritime insurance interests can be expected to back measures which will increase navigational safety and will in all probability support measures, even at some financial cost, which will provide compensation to victims of oil pollution disasters and thus relieve the public pressure for increased standards of liability. It is interesting to note that the greatest portion of the maritime insurance industry is centered in London, adding yet another international dimension to the problem of controlling marine oil pollution.[12]

The men who serve on the tankers are also a major influence on policy formulation through the medium of the maritime labor unions. These unions have successfully resisted efforts by various nations other than their own to exercise jurisdiction over them for their acts on the high seas. Such efforts included the influencing of the 1958 Law of the Sea Conference to overrule by treaty,[13] the effect of the Lotus case.[14] They can be expected to resist efforts by any nation, including their own, to increase the personal liability of a seaman for his negligent or intentional acts of pollution.[15] They can be expected to support safety

measures but would probably resist efforts to establish special training requirements or re-certification procedures.

3:2 NATIONAL INTERESTS

In addition to the interest of every nation in having adequate supplies of oil for its industry and national defense, some nations have particular interest in the formulation of a solution to the oil pollution problem. While there are special interests on the part of the large, industrially developed oil importing nations in maintaining a constant supply of petroleum at as low a cost as possible, nations of the Third World are concerned with building an industrial base and feeding a burgeoning population. For the solution to both these problems, oil is an indispensable element. What may be a matter of convenience or expense to richer nations is a matter of survival to developing nations. Such nations will be chiefly concerned with these goals when considering any proposals for international oil pollution control. Cost increasing anti-oil pollution measures can be expected to be particularly unpopular in light of the recent inflation/recession cycle triggered by higher world oil prices.

3:2:1 FLAG OF CONVENIENCE NATIONS

While not exercising any major political, economic or military power, the cooperation of these nations will be essential to achieve any effective international control over high seas oil pollution under the existing international legal structure.[16] These nations, particularly Liberia, presently control over a fifth of the world's shipping tonnage including almost a third of the tanker tonnage.[17]

Flag of convenience nations can be expected to resist measures which would require them to enforce standards that would deprive them of their status as "convenient". By doing so, they would stand to lose millions of dollars in ship registration fees and annual tonnage taxes.[18]

They may, however, be expected to exercise somewhat more control over pollution prevention measures, as required presently under international law,[19] out of fear that growing international dissatisfaction with the existence of such refuges might prompt other, more severe, measures that would deprive them of their present advantage.[20] Such nations can be expected to implement international safety, training, equipment and certification requirements only in conjunction with administrative, fiscal, and technical aid as well as "technology transfer."[21]

3:2:2 COASTAL NATIONS ON TANKER ROUTES

Another group of nations with a particular interest in the oil pollution problem are those which border on the major tanker routes and suffer from the pollution without any commensurate benefit; where they are neither major exporters or importers, nor flag of convenience nations.

A nation which is representative of this group is Indonesia. Not only is Indonesia a coastal nation but a major international strait -- The Straits of Malacca -- passes through the country. Every year some 40,000 ships pass through this strait, including some 8,000 tankers.[22] The Japanese are heavily dependent on oil passing through the strait and have offered to finance badly needed navigational improvements.[23] The Indonesians have not only refused such an offer, but in conjunction with Malaysia on the other side of the strait, they have asserted the right to exclude certain vessels and to exercise tight control over passage through the strait.[24] Both nations assert this right on the basis of severe damage to their coastline and fishing industries[25] although it is contrary to present international law.[26] The arguments of Singapore and Malaysia were dramatically illustrated in January 1976 when the 237,000 DWT Japanese super tanker, Showa Maru, gounded in the straits of Malacca. Only rapid action which included flying in a U.S. Coast Guard anti-pollution team from the United States prevented a major disaster although over a million gallons of oil were spilled.[27]

Indonesia and other nations in a similar situation may be expected to resist safety measures such as improved aids to navigation, inspite

of the obvious benefits on the grounds that the increased tanker traffic and attendant operational pollution would more than offset the protection gained against traumatic pollution. If such measures were coupled with a regime which would allow the coastal state to exercise jurisdiction for protection against operational discharges, their support might be expected. A large number of draft articles on such protective coastal state navigational jurisdiction have been presented at the third UN law of the Sea Conference and some type of provision would appear inevitable.[28]

3:3 THE ECONOMICS OF SUPERSHIPS

As the demand for oil increased over the years, the size and number of tankers kept pace. The size of tankers grew slowly at first, from 5,000 tons in 1900, to 10,000 tons during World War I to the 16,500 ton T-2 of World War II. Even as late as 1950, the average size of tankers was only 28,000 tons.[29] The rising demand for oil after the Second World War, coupled with the 1967 closing of the Suez canal and technological advances in the shipbuilding industry brought about the rapid rise of the "supertanker".[30]

The chief advantage of the supertankers lies in the fact that, beyond a certain size, economies of scale cause the cost of operating a ship to decrease in proportion to the amout of cargo which it can carry. In the past, this has resulted in gross charter earnings of tens of millions of dollars within a few years.[31] On a single voyage, for example a voyage charter from the Persian Gulf to the United Kingdom, a 200,000 DWT tanker charged freight rates of $20/ton with operating costs of $2.40/ton. This resulted in gross earnings of $5 million and a profit of $4.2 million.[32] With such phenomenal profits being made, a strong argument for the oil industry and the shipping industry assuming a greater portion of the burden of oil pollution damage costs was made.[33]

The economies of scale involved with supertankers also extend to construction costs. While a 100,000 ton tanker costs $75/ton to build and a 250,000 DWT about $80/ton, the 326,000 DWT Bantry Class

tankers cost only $20,000,000 or about $61/ton.[34] These giants are 1,100 feet long, 175 feet wide and carry 2,500,000 barrels of oil.[35] At the beginning of 1974, twenty-six ships of over 400,000 DWT were on order and plans were being drawn up for an Ultra Large Crude Carrier of 1,000,000 DWT. This ULCC would be 1,640 feet long, 274 feet wide, and draw over 100 feet of water.[36]

Plans for building such monster vessels were dashed by the Arab oil embargo of 1973 and the attendant price hikes by the Organization of Petroleum Exporting Countries (OPEC). Indeed, the very existence of the supertanker seemed threatened. Profits plummeted as spot charters fell from $8.8 million in October 1973 to as little as $800,000 in March 1975.[37] There has been widespread cancellation of orders for new VLCC's (200-400,000 DWT) and ULCC's (400,000 DWT and up)[38] and hundreds of massive supertankers have been laid up while others search futilely for cargoes.[39] It has been estimated that 30 per cent of the world's tanker fleet or 90 million tons is now surplus.[40]

The chief culprit of the supership disaster is skyrocketing oil prices coupled with the inflation/recession resulting therefrom which has lead to a massive decrease in the demand for oil. Also playing a major role were speculative overbuilding by shipowners, the opening of the Suez canal which is impassable to superships but makes smaller tankers economically competitive and financial maneuvering by the Arabs which may lead to a monopoly of Arab-owned oil tankers or refining of oil in Arab countries, or both.[41] All these factors combined to make the future of the supertanker cloudy. Until international political and economic conditions are stabilized, the shape of measures to be applied to the transportation phase of the oil pollution problem is uncertain.

Although the frantic expansion of the sixties will probably never be seen again, the economies of scale persist and the use of relatively large tankers can be expected to continue. An upswing in the construction of medium crude carries (MCC 100-200,000 DWT) has been reported.[42] Tankers presently carry 60 per cent of the world's oil traffic,[43] and by 1980 will be carrying 2 billion tons of oil by sea yearly.[44] Tankers

constitute 42 per cent of total shipping or 5,000 vessels.[45] Other types of vessels are taking advantage of the same economies of scale. Large Bulk Carriers and Liquified Natural Gas Carriers (LNGC's) are beginning to rival some of the supertankers for size.[46] There seems to be no limit on the size and number of these vessels, and the future will see the oceans becoming increasingly crowded.

3:4 THE DANGERS OF SUPERSHIPS

The seas have never been the safest or most hospitable environment for man. Even today, with modern ships, radios, and the latest search and rescue techniques, each year hundreds of lives and hundreds of ships of the world's merchant fleet are lost at sea. Thousands more suffer serious casualties.[47] With the world's merchant tonnage doubling every eight years and vessels becoming larger and less easily handled,[48] the potential for severe accidents seems to be greater than ever. Although some experts point with pride to the fact that the accident rate has remained constant with an increase in the number of ships,[49] it would seem equally significant that it has not decreased with all the modern advantages available. There has been a series of spectacular accidents involving supertankers in recent years[50] and the potential for more such accidents seems as unlimited as the size of tankers.

Even the relatively new Liquified Natural Gas Carriers (LNGC's) have had serious accidents. In November, 1974, the 43,723 DWT Yuyo Maru collided with the freighter Pacific Ares in Tokyo Won. The freighter had the right of way but the giant LNGC could not turn in time.[51] The Yuyo Maru blew up with great loss of life and, after burning for 17 days and resisting all efforts to put out the fires, had to be sunk by naval gunfire and torpedoes.[52]

With the ever increasing size of ships, particularly tankers and other vessels carrying dangerous cargoes, and the increasing numbers of ships of all kinds, the chances for similar accidents, perhaps involving a Torrey Canyon-like discharge of pollutants, seems very real. As was seen in the discussion in Chapter II, traumatic dis-

charge of oil is already a major cause of destruction to the marine ecosystem. Unless a workable plan for international cooperation to prevent such accidents is formulated in the near future, the prospects would seem dim for the maintenance of a viable coastal ecosystem.

FOOTNOTES CHAPTER III

1. E. COWAN, OIL ON THE WATER, THE "TORREY CANYON" DISASTER 20-23 (1967) (hereinafter cited as Oil on the Water).

2. IBID, p. 3, see also, In Re Barracuda Tanker Corp., 381 F. Supp. 228 (SDNY 1968).

3. IBID, p. 25-26.

4. One must distinguish between "Flag of Convenience" nations such as Liberia, Panama, Lebanon, Cyprus, Singapore and Somalia and "tax haven" countries which, while offering considerable fiscal and tax benefits to registry vessels, fully enforce shipping, safety and navigation regulations. Examples of such "tax haven" countries are Bermuda, The Bahamas, Gibraltar and the Netherlands Antilles. United Nations, organizations for Economic Co-operation and Development (OECD) study on Flags of Convenience, 4 J. MAR. LAW & COM. 231, 233, 237 (1973) (hereinafter cited as OECD study).

5. Indeed, one of the defining characteristics of a "Flag of Convenience nation" is that the country of registy has neither the power machinery nor will to enforce any national or international regulations. OECD study at 232.

6. OECD study at 239-240.

7. Hearings at 115, note Chapter II-12, supra.

8. J. SZTUCKI, ed., SYMPOSIUM ON THE INTERNATIONAL LEGAL REGIME OF THE SEABED 231 (1970).

9. G. Hanley, The Role of the Marine Insurance Industry in the Emerging Regime of the Oceans, in THE LAW OF THE SEA: THE EMERGING REGIME OF THE OCEANS 287 (J. Gamble, ed. 1973) (hereinafter main work cited as Emerging Regime).

10. ID, at p. 288, Clean-up costs of a Torrey Canyon-type disaster have been estimated at $80 million. Meiklejohn, Liability for Oil Pollution Clean-up and the Water Quality Improvement Act of 1970, 55 CORNELL 973, 982 (1971).

11. E. GOLD, OIL POLLUTION: A SURVEY OF WORLD WIDE LEGISLATION 8 (1974).

12. G. Handley, supra note 9.

13. Art. 15, Convention on the High Seas, Sept. 30, 1962, 13 U.S.T. 2312, T.I.A.S. No. 5520, 450 U.N.T.S. 82.

14. Case of the S. S. Lotus, (1927) P.C.I.J., Ser. A., No. 9.

15. Statement of Hoyt S. Haddock, Executive Director, AFL-CIO Maritime Committee in Fearings at 347, note 12, Chapter II, supra.

16. Art. 6, Convention on the High Seas, note 13, supra.

17. Bates & Yost, Where Trends the Flow of Merchant Ships?, in Emerging Regimes at 257, Table 12-1 (hereinafter cited as Bates & Yost).

18. While charging as little as $1.20 per net ton initially and .10 per net ton annually, Liberia has revenues from shipping registry exceeding $5 million per year. OECD study note 4 supra, at 240-243.

19. Art. 24, Convention on the High Seas, note 13 supra.

20. Such as legislation forbidding nationals to register vessels there or serving on such vessels. Nations may also be tempted to remove existing regulatory and tax measures which drove shippers to flag of convenience nations in the first place. Many nations have already taken such action. OECD study at 253.

21. The International Maritime Consultive Organization is already taking steps to implement such a program. Brown and Couper, Future Shipping and Transport Technology in LAW OF THE SEA; CARACAS AND BEYOND (Christy, Clingan etal eds. 1975) (hereinafter cited as Brown).

22. J. Sterba, Two Nations Claim Malacca Strait, The New York Times, June 16, 1974 at 46, col. 1.

23. Id.

24. C. Warwick, The Regulation of Navigation, in 3 NEW DIRECTIONS IN THE LAW OF THE SEA 137 (S. Lay, ed. 1974).

25. Id.

26. Art. 16 $\S\S$ 4, Convention on the Territorial Sea and Contiguous Zone, Sept. 10, 1964, 15 U.S.T. 1606, T.I.A.S. No. 5639, 516 U. N. T. S. 205.

27. The New York Times, Jan. 6, 1975 at 43, col. 6.

28. See generally, Brown, note 21 supra, at 286-287.

29. B. TAVERNIER, GREAT MARITIME ROUTES 269 (1972).

30. Id., p. 270.

31. E. Gold, Pollution of the Sea and International Law-A Canadian Perspective, 3 J. MAR. LAW & COM. 13, 31-32 (1971) (hereinafter cited as Gold).

32. NEWSWEEK, Oct. 19, 1970, at 94-96.

33. Yates, Unilateral and Multilateral Approaches to the Environmental Problem, 21 U. Toronto L. J. 182, 184 (1971).

34. Gold, at 31-32, note 11 supra.

35. G. Handley, The Role of the Marine Insurance Industry in the Emerging Regime of the Oceans, in Emerging Regime at 285, 289, note 9, supra.

36. N. MOSTERT, SUPERSHIP (1974) reviewed, Yardley, The Miami Herald Nov. 10, 1974, at E-1.

37. TIME March 10, 1975 at 41.

38. Some 83 tankers totalling 20 million tons have been cancelled. Cancellation penalties alone may run into hundreds of millions of dollars. Cancellation of an additional 48 tankers of 12 million tons was expected by the first of the year. BUSINESS WEEK Nov. 9, 1974 at 63.

39. Some 168 tankers had been laid-up by March 1975 totalling 11.3 million deadweight tons. BUSINESS WEEK April 28, 1975 at 85.

40. BUSINESS WEEK, June 23, 1975 at 56.

41. BUSINESS WEEK, Nov. 9, 1974 at 63.

42. Id.

43. Post, Private Compensation for Injuries by the Discharge of Oil from Vessels on the Navigable Waters of the United States; A Survey, 4 J. MAR. LAW & COM. 25, 26 (1973).

44. E. GOLD, OIL POLLUTION: A SURVEY OF WORLD WIDE LEGISLATION 9 (1974).

45. Bates & Yost, at 250, note 17, supra.

46. Id., p. 252.

47. Id., p. 260-268.

48. Id., p. 253.

49. Id at 260.

50. TIME, Nov. 25, 1974, at 116.

51. The Washington Post, Nov. 10, 1974, at 15, col. 1.

52. The Miami Herald, Nov. 29, 1974, at 28, col. 3.

CHAPTER IV

THE LEGAL CONTEXT OF INTERNATIONAL COOPERATION

4:1 DEVELOPMENT OF THE INTERNATIONAL LAW OF THE SEA

4:1:1 FREEDOM OF THE SEAS

The concept of jurisdiction over the seas has been a relatively recent development. Ancient seafarers considered the sea the domain of gods and sea monsters and would not consider the assertion of jurisdiction over such personages. Even the Romans, with their Mediteranean hegemony, regarded their concept of mare nostrum as sort of a patrimonial version of mare liberum and never attempted to assert jurisdiction over the waters.[1] The waters of the world remained open to all ships and seamen as a common highway (res communis) throughout the Middle Ages. Perhaps a major reason that no nation asserted jurisdiction or ownership over the oceans during this period is that not only did they have little reason to do so, but there was a lack of developed naval power to enforce it.

The question of whether the seas could be subjected to ownership first arose during the Rennaissance with the resurgence of maritime commerce and the dawning of the Age of Discovery. The use of the seas as avenues of trade and the foreign riches associated with a healthy maritime commerce, as well as the power and wealth connected with discovery and subjugation of new lands, prompted nations to assert ownership of their trade routes and to seek to exclude others from reaping the benefits of maritime commerce and exploration. Large navies were built to enforce these policies. Spain and Portugal made various claims to the same areas of the oceans.[2] This resulted in the Papal Bulls of 1493 which purported to divide ownership of the world's oceans between the two nations.[3]

As other nations, notably England and Holland, began to develop as naval powers, they too sought colonies and a rich maritime commerce. This inevitably led to a series of naval conflicts. The emerging nations sought to justify their actions in terms of the common right of all people to use and enjoy the seas. The most eloquent of the writers in support of this concept was the Dutch state historiographer, Hugo Grotius. In his work, Mare Liberum, published in 1603, he established the concept of freedom of the seas which has lasted to this day and remains one of the basic concepts of the law of the sea. Stated briefly, this principle states that the seas belong to no one and are for the common use of all men for fishing and navigation; free from the interference of others. With the decline of the Spanish and Portugese as naval powers, claims of exclusive jurisdiction over the high seas ceased.[4]

4:1:2 EXCLUSIVE FLAG STATE SOVEREIGNTY

The conflicts over trade and colonies continued even after the establishment of the principle of freedom of the seas.[5] The Dutch, English, French, and others fought a series of naval wars as each sought to capitalize on the increasing trade with India, the East Indies, and the Americas. The intense conflicts and the important role in them played by merchant ships led to the development of a corollary principle of freedom of the seas---no nation save that whose flag a ship flies, may exercise jurisdiction over that ship on the high seas.[6] This principle, based originally on the doctrine of territorial immunity and sovereign rights, was necessitated by the use of merchant vessels as instruments of foreign policy and the need to protect them from interference by other nations on a pretext. Without such a rule, the principle of freedom of the seas would be meaningless.

4:1:3 THE TERRITORIAL SEA

The 19th century saw the principle of the freedom of the sea firmly established as customary international law. It also saw the development of the concept of the territorial sea. This sea consisted

of certain waters adjacent to the coastal nations wherein that nation could exercise exclusive jurisdiction over activities just as it did on land. Such a concept was not incompatible with the freedom of the seas. Indeed, it was first suggested by Grotius in Mare Liberum and was made popular by the necessity of nations to "...secure their coastal waters from smuggling, impressment, neutrality violations, and other possible projections of sea power." [7]

The assertion of this right was based on a number of theories and measured by various means (such as the gun range of coastal batteries, line of sight to the horizon or simply a marine league). By the end of the 19th century, the concept of the territorial sea was firmly established in customary international law and usually had a breadth of three to four miles.[8]

4:1:4 THE RIGHT OF INNOCENT PASSAGE

With the development of the concept of a territorial sea, the problem arose of shipping routes that passed through these seas and straits now enclosed by them.[9] Interference with passage through these areas would be opposed to the hard won doctrine of freedom of the seas. To reconcile these differences, the rule developed that a ship passing through territorial waters without stopping in the coastal state or engaging in activities detrimental thereto (such as smuggling or espionage) was engaged in "innocent passage". A ship thus engaged was free from interference by the coastal state other than the necessity to obey reasonable navigational and safety regulations.

4:1:5 THE CONTIGUOUS ZONE

Another development of this period was the assertion by coastal states of the right to exercise jurisdiction over certain areas of the high seas adjacent to their coasts. This was necessitated by the high incidence of smuggling of contraband, both slaves and commodities, to avoid high import duties and anti-slavery import embargoes.[10] The national security of coastal

nations or coastal colonies was also threatened by arms smuggling and espionage activities giving rise to a recognition of a limited jurisdiction based on principles of self protection. In 1804, the U. S. Supreme Court recognized the right of Portugese authorities to seize a U. S. vessel on the high seas off the colony of Brazil under this principle to enforce their non-contact laws.[11] This concept of a certain contiguous zone for the protection of coastal state interests soon found acceptance in principle although there was little agreement as to the extent of the zone.

4:2 CONTEMPORARY LAW OF THE SEA

The customary concepts of the law of the sea discussed supra along with other concepts were gradually refined through various national claims and interactions until they were codified into a series of conventions at the first United Nations Conference on the Law of the Sea at Geneva in 1958. Along with other precepts of international law, they form the framework of jurisdiction for protection of the marine environment under the present regime.

The world's waters are artificially divided into four distinct categories: (1) Internal Waters, (2) Territorial Seas, (3) Contiguous Zone Waters, and (4) High Seas. Internal waters are those on the landward side of the baseline used to measure the territorial sea.[12] From this baseline, the territorial sea extends seaward some indefinite distance. The 1958 Convention is silent on the breadth of the territorial sea since no agreement could be reached. Claims vary from three miles to two hundred.[13] The breadth of the territorial sea is one of the complexities of the international pollution problem which is hoped to be solved at the third UN Law of the Sea Conference currently underway. Beyond the territorial sea, the waters are high seas.[14] However, a part of these high seas, extending not more than twelve miles seaward from the baseline, may be designated a contiguous zone.[15]

4:2:1 JURISDICTION OVER VESSELS

The jurisdiction to which a vessel is subject depends largely

on the category of waters within which it is located. Since a crew and ship are subject to the jurisdiction of the country of their nationality and/or registry in accordance with the domestic law of that country,[16] the question of jurisdiction chiefly arises in the context of the extent to which a coastal state may exercise jurisdiction over a foreign vessel.

The coastal state has the greatest jurisdiction over vessels when they are within internal waters.[17] Subject to certain customary rules dealing with wholly internal affairs of the vessel, the coastal state has complete authority to prescribe rules for, inter alia, the safe conduct and navigation and the protection of the marine environment and to apply sanctions to violators. This jurisdiction is based on the inherent powers of the nation as sovereign.

In the territorial sea, the coastal state also has sovereign powers to prescribe rules and enforce them.[18] This jurisdiction, however, is subject to the right of foreign vessels to innocent passage through the territorial sea.[19] This right extends to ships either passing through the territorial sea without entering internal waters or proceeding to and from the high seas and internal waters.[20] The coastal state must not hamper the innocent passage[21] but may prescribe reasonable rules relating to transportation, navigation, and the protection of the environment.[22] The enforcement jurisdiction is limited to criminal offenses and only where the crime was committed on board during the passage and had consequences which extend to the coastal state.[23] There are also certain other conditions. Where the passage is to the high seas after leaving internal waters, more extensive jurisdiction may be exercised.[24] In addition to the right of innocent passage, the coastal states jurisdiction is limited over vessels which are forced into territorial waters by damage, wreck, or other superior force so as to be immune under the force majeure doctrine.[25] Other principles of international law such as those governing relations between belligerent vessels and neutral ports, hot pursuit, prize, etc. also govern relations between coastal

states and foreign vessels in their territorial waters.

The jurisdiction of the coastal state in the contiguous zone was originally limited to the prevention of infringement of its customs, fiscal, immigration, or sanitary regulations which would occur within the territorial sea and to punish violations which had occurred within the latter.[26] Since the ratification of the convention, most nations, including the U.S., have extended contiguous zone jurisdiction to include the regulation of fishing within the twelve mile limit.[27] Other nations have extended this jurisdiction even further often to as far as 200 miles. One of the chief controversies on the scope of jurisdiction in the contiguous zone as it relates to pollution prevention is whether such measures may be properly included under the heading of sanitary regulations.[28] Many cogent arguments have been put forth in support of this contention, and it is gaining adherence in light of growing awareness of the need for effective controls.[29]

4:2:2 ENFORCEMENT ON THE HIGH SEAS

On the high seas, the coastal state has no prescribing competence and only limited enforcement competence.[30] The doctrine of hot pursuit allows the coastal state to apprehend vessels on the high seas for violations occurring in the territorial sea when pursuit is begun there.[31] Any other ship on the high seas, under present international law, is subject only ot the jurisdiction of the flag state.[32] The laxness of many flag states in failing to require pollution prevention measures on the part of their vessels and the inability of coastal states to enforce anti-pollution regulations on the high seas has been a major obstacle to effective international pollution control. In some limited circumstances, where the action on the high seas has effects within the territory in violation of international law and the vessel subsequently enters the waters of that nation, jurisdiction may be exercised in some circumstances under the impact territoriality theory developed in the Case of the S.S. Lotus.[33] In cases where the coastal state is severely threatened by an incident

involving a foreign vessel which remains on the high seas, the coastal state may seek to exercise jurisdiction under a "protective" principle analagous to self-defense. The actions of the U.K. in dealing with the Torrey Canyon are illustrative.

4:3 DEVELOPMENT OF INTERNATIONAL COOPERATION

Two major problems which arise in the prevention of oil pollution are the lack of uniformity of regulations and the absence of effective control on the high seas. While the coastal state has jurisdiction to prescribe reasonable rules for the prevention of such pollution and enforce them in its internal waters, territorial sea, and, arguably, contiguous zone; unilateral attempts to enforce such jurisdiction by the nations of the world could lead to a plethora of conflicting regulations and equipment requirements. If such jurisdiction is to be exercised it should be done efficiently without placing an unacceptable burden upon maritime commerce. Multiplicity of standards alone would constitute such a burden without reference to the additional financial burden. International cooperation for the formulation of uniform standards for regulation, prevention, equipment requirements and other areas is necessary. The lack of effective control by flag states over high seas pollution by their vessels is exceeded only by their reluctance to subject their vessels to authority of another state. Most nations share this view to a certain extent and would seek to limit the exercise of jurisdiction on the high seas.

In an attempt to resolve the conflicts between the principles of the law of the sea and the need to protect the marine environment from oil pollution, nations have sought, periodically, to agree on measures which would establish the necessary uniformity and prevent pollution without altering the basic framework on international law and opening the door to problems in unrelated areas such as would arise with the creation of an international enforcement authority.

The problem of oil pollution was first recognized and concern voiced as early as 1922.[34] The U.S. called an international conference of major maritime nations to discuss the problem in

Washington, D.C. in 1926.[35] This first international oil pollution conference drafted a treaty calling for areas of up to 50 miles around each nation wherein the discharge of oil would be prohibited. Although the national representatives signed the draft, no nation ratified it.[36]

International interest in the prevention of such pollution continued, however, and attempts were made to arrive at a solution through the League of Nations in 1930.[37] Rapidly changing international political and economic events precluded any further action during the 1930's and the outbreak of war in 1939 brought efforts to a halt.

After the Second World War, during which large scale sinkings of tankers had brought home once again the problems of oil pollution, further efforts were undertaken to solve the problem through further international cooperation and the medium of new international organizations.

4:3:1 INTERNATIONAL MARITIME COOPERATION HISTORICALLY

The nations of the world have a long history of cooperation in maritime affairs. Trading ships were responsible for much of the early commerce and communications among nations. Trading ports were filled with seamen from all nations and soon each nation recognized the need for uniform practice in maritime matters. As each nation borrowed suitable practices from another, a degree of uniformity and practicality arose in admiralty law, as it has become known, which has seldom been achieved in other areas of international law.[38]

In addition to the development of an effective system of uniform private law, nations of the world frequently found it beneficial to cooperate in the conduct of other areas of their marine affairs. The development of international cooperation in this area is one of the best and earliest examples of the benefits to be gained from mutual cooperation. Through various mechanisms, agreement was reached on rules for the prevention of collisions

on the high seas and penalties for the breach thereof, The Scotia, 81 U.S. (14 Wall.) 170 (1871);[39] standards for communications and international codes; lifeboats; rescue assistance; loadlines; safety equipment, and many other areas including international patrols to protect shipping lanes from icebergs.[40] Effective cooperation in these areas continues to the present day through various organizations and conventions.

This cooperation has been least effective in dealing with problems of pollution. The success of uniform rules in other areas was brought about by an economic need for cooperation and observance and enforcement by flag states on a voluntary basis was effective because ships had little to lose and much to gain from such conformity. In pollution matters, the benefits of prevention are not direct and the need for abatement is not always obvious. The observance of prevention standards, however, is frequently costly in both time and money. There is little incentive for unilateral enforcement on the part of many nations unless other vessels observe the same standards. Since traditional methods of cooperation failed, efforts were made to arrive at solutions through organizations.

4:3:2 COOPERATION THROUGH INTERNATIONAL ORGANIZATIONS

In addition to the many conventions and agreements on oil pollution of the marine ecosystem, a large number of organizations labor diligently to define the problem and arrive at some workable solutions. These organizations include international agencies, regional committees and groups of concerned non-governmental individuals. A pressing need exists for such organizations and continued pressure from all interested persons must be maintained. Sustained professional concentration upon this intricate problem continues to be a necessity "in a world where many can not afford to be clean."[41] This segment of the paper attempts to sketch the functions of some of these organizations or the parts of those organizations which work primarily with oil pollution.

At the international level, the Economic and Social Council (ECOSOC) of the United Nations personifies the present strategy for approaching this problem. The ECOSOC subcommittee, Marine Science and its Applications, strives to accelerate studies and integrate ocean-space functions. It endeavors to prevent duplication and foster consistency among the various international agencies. Duplication of effort and the inconsistency of various studies constitute the weakest links in the present system.

The most comprehensive organization in the field employs the acronym of GESAMP for the United Nations Joint Group of Experts on the Scientific Aspects of Marine Pollution. This group originated in 1969 at a joint meeting of IMCO, UNESCO, WMO and FAO; IAEA and WHO joined this group in 1970. With the exception of FAO (Food and Agriculture Organization) which concerns itself exclusively with fisheries and IAEA (International Atomic Energy Administration), which involves itself solely with radioactive wastes, the following paragraphs describe the members of this group. GESAMP allows these six organizations to concentrate on their own specialties while it insures that relevant data gets to all interested parties.

The Intergovernmental Maritime Consultative Organization (IMCO) is the premier agency in the field of oil pollution from ships.[42] A 1948 convention laid the groundwork for IMCO but ratification of that convention took ten years.[43] The organization concerns itself with technical and economic details in the maritime field. Eighty-eight countries belong to IMCO.[44] The Maritime Safety Committee, which wields the greatest power within IMCO, consisted originally of fourteen members. Eight of these fourteen had to represent one of the ten contracting parties with the largest amount of registered tonnage. The developing countries displayed a definite animosity towards IMCO since their economic status prevented them from attaining a position of influence on this select committee.[45] In 1956, IMCO took steps to reorganize the Maritime Safety Committee and render it a bit more palatable to the developing countries. Although eight committee members still come from the big ten,

membership has been increased to sixteen and the other eight must come from diverse geographic areas with no nation having more than one representative.[46] This made it slightly more difficult for the developed nations to obtain a two-thirds majority.

United Nations Education, Scientific and Cultural Organization's (UNESCO) marine science activities come under the auspices of the Intergovernmental Oceanographic Commission (IOC). The main purpose of this office centers about the stimulation and coordination of national scientific research and provision of technical assistance through fellowships and grants.[47] The IOC also accomplished the background work necessary for the Long Term and Expanded Program of Oceanic Research (LEPOR). Working with WMO, IOC undertook the Integrated Global Ocean Station System (IGOSS) to monitor physical parameters within the marine ecosystem.

The World Meteorological Organization (WMO) discharges an important function in its activities as a clearing house for worldwide meteorological and climatological data. Due to the interaction of the ocean and the atmosphere in the marine ecosystem and the importance of the atmosphere as a source of pollutants, WMO's data can be extremely beneficial in the adoption of realistic approaches to the pollution problem.[48]

The World Health Organization (WHO) leads the investigation of waste disposal in the estuarine areas of the world. In several developing countries, WHO aids the development of immediate and longterm multistage programs for control and disposal of domestic and industrial wastes. In addition, the agency maintains an extensive educational program on waste treatment and the marine ecosystem.

A group separate from GESAMP is the Inter-governmental Working Group on Marine Pollution (IGWMP). This group commenced as a preparatory committee to collate materials for the Stockholm Conference on the Human Environment. The group continued to function after the conference and presented the first draft of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter.[49]

As a direct result of the Stockholm Conference, the United Nations Environmental Programme came into existence. This constitutes the first UN agency headquartered within a developing country. Although the establishment in Kenya presents communication, travel, and technical problems; it does symbolize a decision by the developing countries to demonstrate that a major UN agency can operate within the third world.[50] This agency coordinates all of the disparate environmental programs which the UN conducts. By creating a fifty-eight member Secretariat, the developing countries guarantee their domination of this agency.

At the regional level, the North Sea countries support numerous scientific projects on a continuing basis. The Baltic and Mediterranean communities have also undertaken several joint endeavors. In the western hemisphere, Canada and the United States conduct various studies in marine locales of mutual interest.

Within the non-governmental sector, scientists lead the way.[51] On a continuing basis, the International Council of Scientific Unions maintains a Scientific Committee on Problems of the Environment (SCOPE). SCOPE originated to integrate preparatory materials for the Stockholm Conference and, like IGWMP, it continues to function after the termination of the conference. Its membership includes engineers and social scientists, and it strives to organize efforts involving international research. The Scientific Committee on Oceanographic Research (SCOR) began work in 1973 on the identification of research needs and procedures for the more effective exchange of information.[52] Additionally, specialty groups such as the Working Party on Biological Effects of Pollutants carry on important research.

The Comite Maritime International (CMI) represents a non-science interest group which established itself in 1896 "to promote...the unification of international maritime and commercial law practice."[53] Its headquarters stand in Antwerp and membership consists of the national maritime associations of twenty-nine nations. These associations generally orient themselves with the desires of marine carrier and insurance companies. As the Legal Committee of IMCO

begins to assert itself, CMI has let slip what little input it still retains in the process of maritime decision making.

The following comprise a few of the many non-governmental groups which have demonstrated an interest in pollution problems: International Association of Ports and Harbors, International Maritime Committee, and the Permanent Council of the World Petroleum Congress.[54] In addition, the International Association of Ecology and the International Union for the Conservation of Nature Environmental Law Center attempt to keep all states advised concerning the implications of any legislative provisions which come into existence anywhere in the world.[55] A continuing need exists for such organizations since only by cooperative effort can man hope to combat the all encompassing problem of oil pollution.

FOOTNOTES CHAPTER IV

1. 9 TEX. INT'L L.J. 205, 207, (1974).

2. W. MARX, THE FRAIL OCEAN 160 (1967).

3. Id.

4. R. Carleton, Ecology, Law and the Marine Revolution, in PACEM IN MARIBUS 6 (E. Borgese, ed. 1972).

5. As each nation began to develop as a naval power, it first asserted freedom of the seas for protection against the authority of a greater power. Later, as these powers became supreme, they, in turn, frequently ignored the concept when convenient to their ends. This phenomenon has not disappeared completely today.

6. This principle did not spring into existence over night. The U. S. assertion of the right of American ships to be free from interference on the high seas and the British assertion of the right to stop and search for deserters was one, albeit not the only, cause of the War of 1812.

7. Marx. supra note 2, at 166.

8. see generally, S. SWARZTRAUBER, THE THREE MILE LIMIT OF TERRITORIAL SEAS (1972).

9. On the right of innocent passage through international straits, see, The Corfu Channel Case, (1949) I.C.J. 4.

10. Early in U. S. history, cutters of the Revenue Marine were authorized to "visit" ships as far offshore as 4 leagues (12 miles) to enforce smuggling laws. Act of Aug. 4, 1790, c. 35, 1. Stat. 45, establishing the Revenue Marine, the forerunner of the modern Coast Guard.

11. Church v. Hubbard, 6 U. S. (2 Cranch) 187, 2 L. Ed. 249 (1804).

12. Art. 5, Convention on the Territorial Sea and Contiguous Zone, Sept. 10, 1964, 15 U.S.T. 1606, T.I.A.S. No. 5639, 516 U.N.T.S. 205 (hereinafter cited as Territorial Sea Convention).

13. A Second Law of the Sea Conference in 1960 also failed to agree on a delineation.

14. Art. 1, Convention on the High Seas, Sept. 30, 1962, 13 U.S.T. 2312, T.I.A.S. No. 5200, 450 U.N.T.S. 82 (hereinafter cited as the High Seas Convention).

15. Art. 24, Territorial Seas Convention.

16. U.S. v. Flores, 289 U.S. 137, 53 S. Ct. 580, 77 L. Ed. 1086 (1933); Regina v. James Anderson, 11 Cox Crim. Cas. 198, (Ct. Crim. App. 1868).

17. see, Art 5 ss 1, Territorial Sea Convention.

18. Id., Art I.

19. Id., Art 14 s 1.

20. Id., Art 14 ss 2.

21. Id., Art. 15 ss 1.

22. Id., Art. 17.

23. Id., Art. 19 ss 1.

24. Id., Art 19 ss 2.

25. see, Kate A. Hoff Claim, (U.S.v. Mexico) General Claims Comm., 1929 (1928-29) Opinions of Commissioners 174, 4 U.N.R.I.A.A. 44.

26. Art. 24, Territorial Sea Convention, The ILC did not intend to include marine pollution control with sanitary regulations but such an interpretation is now probably customary international law. see WULF, CONTIGUOUS ZONES FOR POLLUTION CONTROL: AN APPRAISAL UNDER INTERNATIONAL LAW 145 (1971).

27. see, S. Rep. No. 1280, 89th Conq., 2nd Sess., 12-13 (1966) 5 INT'L LEG. MATS 616 (1966).

28. Art. 24 ss 1, Territorial Sea Convention.

29. see, WULF, supra at 34-38. But see text accompanying note V-34 infra.

30. Art. 7, High Seas Convention.

31. Id., Art 23.

32. Id., Art. 6 ss 1.

33. (1927) P.C.I.J., Ser. A, No. 9.

34. U. S. Congress, Resolution Noting Damage Done By Oil Pollution and Calling for an International Conference to Deal With the Problem, 42 Stat 821 (1922).

35. Wulf, supra at 94.

36. 4 WHITEMAN DIG. INT'L LAW 696 (1965).

37. Wulf, supra at 99-100.

38. G. GILMORE & C. BLACK, THE LAW OF THE ADMIRALTY §§ 1-2 (1957).

39. Recognizing breach of rules as culpable negligence.

40. W. BURKE, CONTEMPORARY INTERNATIONAL LAW OF THE SEA I-113-L 121 (1974).

41. Schacter & Serwer, Marine Pollution Problems and Remedies, 65 AM. J. INT.L. 84, 111 (1971).

42. For an overview of IMCO in 1970, see, O'Connell, Reflections on Brussells: IMCO and the 1969 Pollution Convention, 3 CORNELL INT.L.J. 161 (No. 1970).

43. For an account of the early history of IMCO, see, C. ALEXANDROWICZ, WORLD ECONOMIC AGENCIES 157 (1962).

44. Treaties in force 354 (Dpt. of State Pub. No 8755, 1974), 13 Int'l Leg. Mats. (1974) and 14 Int'l Leg. Mats. to 1102 (1975) updating this treaty information to July 1975.

45. Mendelsohn, Ocean Pollution and the 1972 United Nations Conference on the Environment, 3 J. MAR. LAW & COM. 385 (1972).

46. 1965 Amendment to the Convention on the Intergovernmental Consultative Organization, Sept. 28, 1965, 19 U.S.T. 4857, T.I.A.S. No. 6490, 649 U.N.T.S. 334.

47. Kay, International Transfer of Marine Technology: The Transfer Process and International Organizations, 2 OCEAN DEVELOPMENT AND INT'L L. J. 351 (1974).

48. See text accompanying note I-20, supra.

49. See text accompanying note V-38 infra.

50. Wilson, Creating Mechanisms for International Environmental Action: Requirements and Responses 8 STAN. J. INT'L STUDIES 113, 121 (1973).

51. For an overview of the non-governmental sector, see, T. WILSON, INTERNATIONAL ENVIRONMENTAL ACTION (1971).

52. For a detailed report of SCOR work in the international arena, see, Wooster, Interaction Between Intergovernmental and Scientific Organizations in Marine Affairs 2 INT'L ORG. 255 (1973).

53. Mendelsohn, The Public Interest and Private International Maritime Law, 10 WM. & MARY L.R. 783, 894 (1969).

54. Information on these organizations and others can be found in WENK, THE POLITICS OF THE OCEAN (1972).

55. BUREAU OF NATIONAL AFFAIRS, INTERNATIONAL ENVIRONMENTAL GUIDE 41:903 (1974).

CHAPTER V

INTERNATIONAL RESPONSES TO THE OIL POLLUTION PROBLEM

5:1 ANALYSIS OF THE ELEMENTS OF THE PROBLEM

The following portion of this paper details the responses initiated by the international community to solve the problem of oil pollution within the marine ecosystem. The cooperative endeavors of the world's nations include conferences, conventions, and agreements.

To provide an analytic framework for discussing the international aspects of this problem, the authors divide the oil pollution problem into its three constiuent elements. Prevention, control, and liability comprise these three elements.

Prevention entails all the possible alternatives which can be undertaken to preclude oil from entering the marine ecosystem as a pollutant, For the purposes of this paper, prevention denotes keeping the oil inside of the vessel and outside of the marine ecosystem.

The second component, control, pertains to the strategies that become imperative when prevention fails. Oil pollutes the marine ecosystem and man attempts to reduce this contingency both in terms of time and space. These efforts circumscribe everything from a rag tied around a dripping transfer pipe to the most sophisticated oil skimming devices. Jurisdictional questions raise even more important problems.

Finally, the participants confront the liability segment of this problem. The oil causes some finite damage, and someone must pay to rectify the situation. Both a large and a varying number of participants can become involved in this element of the problem.

Some of the obvious parties here include the shipowner, cargo owner, government of the coastal State, and the individual property owner along the coastline.

Employing this framework, this paper now analyzes the various conferences, conventions, and agreements. The first group of conventions discussed manifest cooperative effort in the realm of prevention.

5:2 PREVENTION OF OIL POLLUTION

5:2:1 1954 CONVENTION FOR THE PREVENTION OF POLLUTION OF THE SEA BY OIL

The 1954 International Conference on the Pollution of the Sea by Oil held in London resulted in the 1954 Convention for the Prevention of Pollution of the Sea by Oil[1] which although antiquated still maintains its status as the premier covenant in the prevention sector. Following the required ratification of the 1962 amendments to this Convention, they went into force during 1967.[2] The 1969, 1971, and 1973 amendments to the Convention still await acceptance by two-thirds of the parties to the Convention in accordance with Article XVI. As of July 1975, sixty-one countries had become parties to the Convention.[3] These nations manage in excess of sixty percent of the world's tanker tonnage.[4]

The original Convention applied to all non-naval vessels in excess of 500 gross tons with the exception of whalers and ships navigating the North American Great Lakes.[5] It prohibited the discharge of oily mixtures (100 parts per million) by tankers within certain zones which generally extended no more than fifty miles offshore. Although Australia surrounded much of her shores with a 150 mile belt.[6] In regards to non-tankers, three years after the Convention came into operation all vessels were required to observe the established prohibition zones unless proceeding to a port which failed to provide reception facilities for oily residues.[7] Other exceptions to the discharge rule embraced

safety, unavoidable leakage, sediment, and lubricating oil.[8]

The Convention intrusted enforcement authority to the flag States. These nations had to impose penalties no less than those imposed for discharge within their own territorial waters.[9] Article X relegated other nations a status of informers to and investigators for the flag States. The Flag States would ascertain the sufficiency of any evidence collected.

In addition, the 1954 Convention encouraged the on-board utilization of oily-water separators and the construction of oil residue reception facilities by coastal nations.[10] All vessels must maintain an Oil Record Book which evidences the disposition of all oil handled by the ship.[11]

Thirty-two nations signed this covenant and the Convention became operative in 1958 having secured adequate ratification. The United States ratified it in 1961.

A 1962 Conference of contracting parties adopted amendments to the 1954 Convention and communicated these for acceptance by member governments. Primarily, this amendment increased the number of ships required to observe Convention standards. Article II appended tankers from 150 to 500 gross tons and encouraged members to apply these provisions to other vessels less than 500 gross tons. Although the general prohibited area remained a mere fifty miles offshore, most of the specific zones now extended one hundred miles from shore.[12]

The enforcement machinery envisioned by the Convention remained unchanged with the exclusion that penalties no lower than those meted out for discharges within territorial waters should "be adequate in severity to discourage any such unlawful discharge."[13]

On the technical side, the amendment provided more detailed information in regard to the oil residue reception facilities required of coastal nations.[14] Additionally, the amendment prohibited any discharge from any vessel greater than 20,000 gross tons contracted for after May of 1967 unless the master found himself in extenuating circumstances.[15]

As a result of the foundering of the Torrey Canyon in 1967, a third meeting assembled in 1969 at London. The 1969 amendment limited discharges to mixtures less than 100 parts per million of oil and then only at a rate of sixty liters per mile. For tankers, the rate could not amount to a quantity in excess of 1/15,000 of the total cargo-carrying capacity.[16] Again, no discharge may occur within fifty miles of land, and hopefully, the allowed discharges would prove to be of negligible magnitude. Annex 13 enlarged the specificity required in the maintenance of the Oil Record Book.

The 1969 amendment also endeavored to assure that this Convention would be enforced. The flag State must promptly inform the nation reporting the alleged contravention of the covenant and the Inter-Governmental Maritime Consultive Organization of all "action taken as a consequence of the information communicated."[17]

The 1971 assembly adopted a third amendment to the Convention. This amendment introduced a new Annex C which established requirements for tank arrangements and size. These regulations employed functional parameters based upon hypothetical collision and stranding occurrences.[18] Rupture possibility and outflow rates assumed prime importance in these determinations.

A new addendum to Article IV demanded that any tanker which had its keel laid after 1972 or would be scheduled for delivery after 1976 conform to Annex C within two years of the acceptance of this 1971 amendment.[19] Obviously, all tankers constructed after the prescribed confirmation of this amendment must comply with Annex C and all such tankers require a certificate attesting to their observance.[20] Tank vessels of member nations which fail to abide by these specifications may also be banned by another member from the latter's territorial sea in accordance with Article VI bis.

Although the 1954 Convention for the Prevention of Pollution of the Sea by Oil and its various amendments fashion significant prevention authority, this Convention has definite limitations.

Enforcement represents a prime failing because even with present technology, difficulties abound in discovering a spill close enough to a ship to implicate it. The possible contravention must then be forwarded through diplomatic channels, and finally the flag nation determines the sufficiency of any data collected.

In addition, no mechanism exists for insuring that coastal nations construct reception facilities. Lastly, the Convention can only apply to signatory flag nations, and therefore, more than thirty per cent of the world's tanker fleet answers to no one.[21]

5:2:2 HIGH SEAS CONVENTION

The Convention on the High Seas[22] signed in 1958 and operational in 1962 also deals with prevention. The member parties of this Convention presently number fifty-three.[23] Article 24 of the Convention proclaims that:

> Every State shall draw up regulations to prevent pollution of the seas by the discharge of oil from ships or pipelines or resulting from the exploitation and exploration of the seabed and its subsoil, taking account of existing treaty provisions on the subject.

The cooperation which this article envisions falls far short of an obligation to comply with the wishes of a majority of the members or the regulations of an international organization.[24] The obligation not to pollute in a manner which hampers the interests of other states seems clear;[25] however, a problem exists as to the classification of pollution which does not contaminate another state's territory. One who thus harms the natural resources of the high seas deprives all states of their common heritage; but what state has standing to object to this particular conduct? Once again, the states confront the problem of exclusive enforcement by flag States.

5:2:3 SHELF CONVENTION

The second Geneva convention promulgated by the Law of the Sea Conference concerns the continental shelf.[26] Fifty-three

nations have become members of this Convention[27] and it has been in effect since 1964.[28]

Article 5 of the Convention on the Continental Shelf requires that any exploratory or exploitive actions not culminate in adverse affects upon the conservation of the sea's living resources. Around those structures which the coastal State may construct upon the continental shelf, exists the specific task of protecting living resources from any impairing agents.[29]

5:2:4 TERRITORIAL SEA AND CONTIGUOUS ZONE

The Convention on the Territorial Sea and the Contiguous Zone[30] represented the third product of the Law of the Sea Conference, and this Convention became effective in 1964. Presently, forty-three nations have become members.[31]

This Convention allows the coastal State the competence to apply its rules to any conduct of a vessel within the state's territorial sea which appears "prejudicial to the peace, good order or security of the coastal State."[32] In addition, the coastal State may assert its rules over any vessel not in innocent passage.[33]

In a zone no greater than twelve miles from the coastal State's base line, a coastal State also maintains the power to control sanitary matters, but it seems doubtful if "sanitary" in 1958 meant the same as "pollution" does today.[34] Even given the applicability of pollution controls to contiguous zones, this convention has minimum significance since it merely effects a small border about the world's oceans.

5:2:5 FISHING CONVENTION

Only thirty-four states[35] constitute the membership of the Convention on Fishing and Conservation of the Living Resources of the High Seas.[36] Article 7 to this Convention permits a coastal State to initiate unilateral action within its contiguous zone to protect a living resource with special attachment to that state. A difference of opinion exists as to whether or not this authorizes

anti-pollution regulations.[37] Despite the outcome of this decision, the fact remains that, similar to the Convention on the Territorial Sea and the Contiguous Zone, this Convention only has application to a twelve mile border at the periphery of the oceans.

5:2:6 DUMPING CONVENTION

The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters[38] finishes this portion on past preventative measures. The representatives of eighty states met in London in 1972 to adopt this Convention.

This Convention applies to the oil pollution problem since its definition of wastes and other matters includes all substances. Basically, the Convention totally prohibits the dumping of wastes designated by its black list and allows a second grouping to be dumped only after the granting of a special permit.[39] The black list of prohibited substances includes oil.[40] As usual, provision exist for instances of safety and emergency situations;[41] and the state from which the dumping originates maintains enforcement authority.[42]

All contracting parties pledge to protect the marine environment from a number of harmful substances, which specifically include oil in their number.[43] Ratification by any fifteen states brings this Convention into force;[44] however, it presently stands in the shadows awaiting the final outcome of the 1976 Law of the Sea Conference.[45]

5:3 CONTROL OF OIL POLLUTION

In the control sector of the oil pollution problem, only the Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (Public Law Convention)[46] has been adopted, and it came into force May 6, 1975. The wreck of the Torrey Canyon acted as the prime mover in generating the 1969 Brussel's Conference which produced this Convention. The forty-eight official participating states at the Conference produced both this control measure and the Convention on Civil Liability for Oil Pollution Damage.[47]

Article I of the Convention establishes the basic principle which underlies the Convention:

> Parties to the present Convention may take such measures on the high seas as may be necessary to prevent, mitigate or eliminate grave and iminent danger to their coastline or related interests from pollution or threat of pollution of the sea by oil, following upon a maritime casualty or acts related to such a casualty, which may reasonably be expected to result in major harmful consequences.

With the exception of cases of extreme emergency, the Public Law Convention contemplates that the coastal State apprise the flag State and notify any interested third parties.[48] In addition, any action taken by the coastal State must be consistent with the actual harm which threatens that state.[49] When the coastal State goes beyond the boundary of necessary acts, it makes itself liable to compensate any injured third party.[50]

With the exception of the twelve mile contiguous zone concept,[51] this represents the first covenant which recognizes coastal State competence beyond its territorial waters. The restricted sally of reasonable proportions that this Convention contemplates may be forced within the conceptual framework of freedoms set forth in the Convention on the High Seas.[52] But a better solution can be deduced by defining oil pollution in terms comparable to piracy and thereby exercising universal jurisdiction.[53]

5:4 LIABILITY FOR OIL POLLUTION

The liability element of the oil pollution problem contains both active non-governmental agreements and international conventions and other international conventions awaiting ratification and acceptance. Since the non-governmental agreements have existed as functioning entities for some time, this discussion begins with a description of the two industry agreements dealing with liability for clean-up and damage.

5:4:1 TOVALOP

The Tanker Owners Voluntary Agreement concerning Liability for Oil Pollution (TOVALOP)[54] became effective in 1969. This organization claimed the participation of more than 92 per cent of the world's private tanker fleet.[55]

The agreement relates to any tank vessel which carries bulk quantities of oil;[56] and the owner of each such vessel, whether or not a bareboat charterer, engages to clean-up the spill or to reimburse the state government[57] which undertakes the removal operation.[58] TOVALOP applies whether the tank vessel sails full of oil or with only water ballast. Under this agreement, pollution damage refers to physical contamination and not fire, ecological, or consequential damages.[59]

Liability under TOVALOP finds its basis in negligence, and the owner has the burden of proving freedom from negligent acts.[60] TOVALOP also encourages owners to undertake clean-up operation even in the absence of negligence. The agreement sets a liability ceiling at $100 per gross ton or $10,000,000.[61] A government has one year in which to file its claim[62] and must agree prior to receipt to release the owner from all other claims.[63]

5:4:2 CRISTAL

The second industry agreement employs the acronym CRISTAL for Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution.[64] Unlike TOVALOP, the members of this agreement comprise the petroleum industry which imports the oil. CRISTAL came into effect in 1971 and today it embraces more than eighty per cent of the petroleum industry.[65]

CRISTAL proposes to supplement the money available under TOVALOP[66] or the Liability Convention[67] and to motivate owner clean-up operations. This agreement's definitions mesh with those of the Liability Convention more than they do with the articles of TOVALOP.[68] For that reason, it pertains to cargo runs and not ballast runs.

Three criterion comprise a CRISTAL decision to disperse money toward any incident. First, one of the members of the agreement has to own the offending oil.[69] Second, the tanker owner must be a member of TOVALOP if the incident occurred prior to the June 1975 acceptance of the Liability Convention.[70] Third, rules established by the Liability Convention create the owner's liability.[71]

CRISTAL provides up to $20,000,000 to tanker owners to cover monies in excess of $125 per ton or $10,000,00 which the owner utilizes in a clean-up activity.[72] This agreement also provides up to $20,000,000 in funds to injured persons who fail to receive adequate compensation from other sources.[73]

Claims against CRISTAL must be initiated within one year,[74] and the courts of England have jurisdiction over any cases arising under the terms of the agreement.[75] CRISTAL automatically terminates when the Compensation Fund Convention[76] comes into effect.[77]

5:4:3 LIABILITY CONVENTION

The 1969 Brussel's Conference[78] adopted the Convention on Civil Liability for Oil Pollution Damage (Liability Convention)[79] and a sufficient number of states ratified the Convention so that it came into force June 19, 1975.[80] The Convention refers to vessels of a contracting state actually carrying oil in bulk.[81] The focus of the Convention appears to be the owners ability to limit his liability to 210,000,000 Poincare Francs ($16.8 million) or 2,000 Poincare francs ($160) per ton.[82] Vessels carrying in excess of 2000 tons of oil must establish security in amounts equal to the Convention formula.[83] This Convention bases liability on principles of strict liability[84] as opposed to the negligence standard employed by TOVALOP.[85]

Claimants may bring suit in any contracting state which suffers damage to its territorial sea from the incident within six years of the date of the incident.[86] The Liability Convention also imposes other important authority upon the contracting states. The financial security mentioned above must be evidenced by a certificate issued

by the flag State.[87] Flag State members also waive sovereign immunity with relation to state-owned commercial vessels.[88]

Problems with the Liability Convention include the fact that it provides no relief for the destruction of living resources of the sea.[89] The Convention also seems somewhat unrealistic in failing to consider the much used system of bareboat chartering.[90]

5:4:4 COMPENSATION FUND CONVENTION

Two years after the adoption of the Liability Convention another Conference met at Brussels to adopt a supplement to the prior Convention. This 1971 conference resulted in the Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (Compensation Fund Convention).[91] Twelve states signed the Convention; and like so many other matters, its acceptance has been delayed by the present string of Law of the Sea Conferences.[92]

The Compensation Fund Convention intends to furnish additional compensation in excess of the Liability Convention[93] for oil pollution damage within the territorial sea.[94] Both the state whose territory was damaged and the flag State must be parties to the Convention.[95] Also, the incident must be occasioned by the non-intentional and non-negligenct activity of a ship which results in either no liability under the Liability Convention or exceeds the owner's liability under that convention.[96]

The covenant allows a maximum of 450 million Poincare francs ($36 million) damages as the total determined by adding its compensation to that of the Liability Convention.[97] This Convention also reimburses the owner for any amounts between 1,500 Poincare francs and 2,000 Poincare francs per ton which the owner pays in remuneration.[98] The same courts which have jurisdiction under the Liability Convention[99] also have the competence to adjudicate Compensation Fund disputes.[100]

The Fund established by the Convention receives its money from persons within contracting States who import quantities

exceeding 150,000 tons of oil in any year.[101] The total amount paid results from a fixed factor[102] multiplied by the number of tons received by an individual.[103] The duty of insuring that the Fund receives this money rests upon each contracting State.[104]

The Convention comes into force when accepted by eight or more states that have imported a total of 750 million tons of oil during the preceding year.[105] The Executive Committee must be chosen with due regard to an equitable geographic distribution, but half of the members must represent those states which have contributed most to the Fund during the previous year.[106]

5:5 SUMMARY

All of these conventions incorporate the same basic weaknesses, and they all must wrestle with the problems of jurisdiction beyond the state's territorial sea. As the first chapter of this paper illustrated, lines drawn on charts cannot adequately cope with the oil pollution problem. In addition, each one depends upon an active and futuristic role by the flag States. In regard to these states, it appears highly unlikely that Panama, Honduras, or Liberia have the capability of enforcing the responsibility given to them even if they determine that such a course of action would be in their best interest.

Although they demonstrate admirable motivations, these Conventions appear doomed from inception. Insistence of contracting parties on antiquated frameworks undermine any meaningful international cooperation. More emphasis must be devoted to the technical problems created by a traumatic oil spill and less time wasted arguing jurisdiction.

FOOTNOTES CHAPTER V

1. 1954 Convention for the Prevention of Pollution of the Sea by Oil, Dec. 8, 1961, 12 U.S.T. 2989, T.I.A.S. No. 4900, 327 U.N.T.S. 3, (hereinafter 1954 Prevention Convention).

2. 1962 Amendment to the Convention for the Prevention of Pollution of the Sea by Oil, May 18, 1967, 17 U.S.T. 1523, T.I.A.S. No. 6109, 600 U.N.T.S. 332, (hereinafter 1962 Prevention Amendment).

3. Treaties in force 354 (Dpt of State Pub. No. 8755, 1974), 13 Int'l Leg. Mats. (1974) and 14 Int'l Leg. Mats. to 1102 (1975) updating this treaty information to July 1975.

4. R. SHINN, THE INTERNATIONAL POLITICS OF MARINE POLLUTION 64 (1974).

5. 1954 Prevention Convention art. II.

6. Id. annex A.

7. Id. art. III

8. Id. art. IV & V

9. Id. art. VI

10. Id. art. VII & VIII

11. Id. annex B.

12. 1962 Prevention Amendment annex A.

13. Id. art. VI

14. Id. art. VIII

15. Id. art. III

16. 1969 Amendment to the Convention for the Prevention of the Pollution of the Sea by Oil, done Jan. 16, 1970, 9 INT'L LEG. MATS. 1 (1970) (hereinafter 1969 Prevention Amendment).

17. Id. art. X.

18. 1971 Amendment to the Convention for the Prevention of the Pollution of the Sea by Oil, adopted Oct. 15, 1971, 11 INT'L LEG. MATS. 267 (1972), annex C.

19. Id. art. VI bis.

20. Id.

21. See text accompanying note V-4 supra.

22. Convention on the High Seas, Sep. 30, 1962, 13 U.S.T. 2312, T.I.A.S. No. 5200, 450 U.N.T.S. 82 (hereinafter High Seas Convention).

23. TREATIES IN FORCE, etc. supra note 3, at 534.

24. Butte, Controlling Marine Pollution - World Task or National?, 8 STAN. J. INT'L STUDIES 99, 102 (1973).

25. High Seas Convention art. 2.

26. Convention on the Continental Shelf, Jun. 10 1964, 15 U.S.T. 471, T.I.A.S. No. 5578, 499 U.N.T.S. 311 (hereinafter Shelf Convention).

27. TREATIES IN FORCE, etc. supra note 3, at 534.

28. Shelf Convention.

29. Shelf Convention art. 5.

30. Convention on the Territorial Sea and Contiguous Zone, Sep. 10, 1964, 15 U.S.T. 1606, T.I.A.S. No. 5639, 516 U.N.T.S. 205 (hereinafter Territorial Sea & Contiguous Zone Convention).

31. TREATIES IN FORCE, etc. supra note 3, at 535.

32. Territorial Sea & Contiguous Zone Convention art. 14.

33. Id. art. 16.

34. Danzig, Marine Pollution - A Framework for International Control, 1 OCEAN MANAGEMENT 347, 356, (1973).

35. TREATIES IN FORCE, etc. supra note 3, at 312.

36. Convention on Fishing and Conservation of the Living Resources of the High Seas, Mar. 20, 1966, 17 U.S.T. 139, T.I.A.S. No. 5969, 599 U.N.T.S. 285.

37. Danzig, supra note 34, at 356.

38. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, adopted Nov. 13, 1972, 11 INT'L LEG. MATS. 1294 (1970); Kullenberg, Ocean Dumping Sites, 2 OCEAN MANAGEMENT 189 (1975) provides a thorough analysis of the difficulties involved in ocean dumping and discusses this Convention.

39. Id. art. IV

40. Id. annex I

41. Id. art. V

42. Id. art. VI & VII

43. Id. art. XII

44. Id. art. XVIII

45. Id. art. XIII

46. Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, done Nov. 29, 1969, 9 INT'L LEG. MATS. 25 (1970) (hereinafter Public Law Convention).

47. See text accompanying note V-79 infra.

48. Public Law Convention art. III (a) & (b).

49. Id. art. V.

50. Id. art. VI

51. See text accompanying note V-30 supra.

52. High Seas Convention art. 16.

53. O'Connell, Reflections on Brussels: IMCO and the 1969 Pollution Conventions, 3 CORNELL INT'L L. J. 161, 174. (1970).

54. Tanker Owners Voluntary Agreement concerning Liability for Oil Pollution, Oct. 6, 1969, 8 INT'L LEG. MATS. 497 (1969) (hereinafter TOVALOP).

55. R. SHINN, supra note 4, at 75.

56. TOVALOP art. I (e) defines oil in broad terms which take in even asphalt and bitumen.

57. Id. art. I (i) refers to governments as either local or national.

58. Id. art. I (a) & (b).

59. Id. art. I (h).

60. Id. art. IV.

61. Id. art. VI

62. Id. art. VII (D)

63. Id. art. VII (F)

64. Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution, Apr. 1, 1971, 10 INT'L LEG. MATS. 137 (1971) (hereinafter CRISTAL).

65. R. SHINN, supra note 4, at 75.

66. See text accompanying note V-59 supra.

67. See text accompanying note V-79 infra.

68. Compare CRISTAL art. I (A), (C), (E), and (F) with Convention on Civil Liability for Oil Pollution Damage, done Nov. 29, 1969, 9 INT'L LEG. MATS. 45 (1970) art. I (1), (3), (6), and (7).

69. CRISTAL art. IV (A).

70. CRISTAL art. IV (A) (1) (a).

71. Id.

72. Id. art. IV (C) (1).

73. Id. art. IV (C) (2) & (E).

74. Id.

75. Id. art. IX

76. See text accompanying note V-91 infra.

77. CRISTAL art. (B) & (C).

78. See text accompanying note V-46 supra.

79. Convention on Civil Liability for Oil Pollution Damage, done Nov. 29, 1969, (INT'L LEG. MATS. 45 (1970) (hereinafter Liability Convention).

80. 14 INT'L LEG. MATS. 1102 (1975).

81. Liability Convention art. I.

82. Id. art. V para. 1. The Convention has its own formula for determining tonnage.

83. Id. art. VII para. 2.

84. Id. art. V para. 2.

85. See text accompanying note V-58 supra.

86. Liability Convention art. IX.

87. Id. art. VII para. 2.

88. Id. art. XI para. 2.

89. Hunter, The Proposed International Compensation Fund for Oil Pollution Damage, 4 J. MAR. L. & COMM. 117, 126 (1973).

90. Gordon, A Short Cruise on the Good Ships TOVALOP and CRISTAL, 5 J. MAR. L. & COMM. 609, 621 (1974).

91. Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, done Dec. 18, 1971, 11 INT'L LEG. MATS. 284 (1972) (hereinafter Compensation Fund Convention).

92. See text accompaying note VII-68 infra.

93. Compensation Fund Convention art. 2.

94. Id. art. 3.

95. Id.

96. Id. art. 4 (1) & (2).

97. Id. art. 4 (4).

98. Id. art. 5 (1).

99. See text accompanying note V-83 supra.

100. Compensation Fund Convention art. 7.

101. Id. art. 10.

102. Id. art. 11 (2).

103. Id. art. 11.

104. Id. art. 13 (2).

105. Id. art. 40.

106. Id. art. 22.

CHAPTER VI

TECHNICAL ASPECTS OF THE OIL POLLUTION PROBLEM

6:1 INTRODUCTION

These international responses to an oil pollution incident within the marine ecosystem do not operate in a legal vacuum. The complexity of this problem demonstrates the importance of interdisciplinary efforts. Jurisdiction and liability decisions appear valueless if they do not coalesce with the state of the art in science and engineering. Continuing to employ the same analytic framework, this segment of the paper discusses the technical portion of the oil pollution question.

6:2 TECHNIQUES FOR PREVENTION

6:2:1 ONBOARD THE VESSEL

The realm of prevention of oil pollution from ships can be divided between techniques applied to the ship and those imposed on coastal waters. Further categorization within the ship technique section includes navigation, construction, and transfer. Navigation refers to the art of manuevering a tanker from point A to point B.[1] The training of qualified personnel appears to be the most important input to navigation, and these qualified personnel must be equipped with adequate communication apparatus and navigational instruments. Navigational instruments include radar, depth sounding devices, and position fixing devices.

The ship itself can be constructed in a manner which reduces the possibility of massive oil pollution. Naval engineering techniques can guarantee that tank arrangement[2] and individual tank size[3] minimize the consequences of a high energy impact upon the tanker's hull.

Under normal operating conditions, tankers can utilize

separate water ballast tanks[4] to eliminate the oily water discharge problem.

Transfer systems represent the third area of ship management which has the capability of contributing significantly to pollution abatement. As with navigation, the use of qualified personnel constitutes a prerequisite. Universal specifications for transfer equipment excludes the problem inherent in jury rigs and assures the inclusion of emergency shutdown devices.[5] In additon, diagnostic testing[6] may identify weak points before they become sources of pollutants.

6:2:2 IN COASTAL WATERS

The second area of prevention concerns the role of the coastal State in providing safe passage through its waters. Traditionally, this constitutes a passive role, but the fear of catastrophic oil spills has thrust many nations into a more active stance. The passive mechanisms include buoy systems, electronic navigational aids, rules of the road, and offshore terminal facilities.[7]

The active devices usually begin with a designation of environmentally critical areas by the coastal State. This enables the coastal State to develop a workable assortment of priorities along its coast.[8] Using this as a reference point, the coastal State can implement Traffic Separation Schemes (TSS) or Routeing Systems to control the flow of vessels.[9] The next step after TSS involves Vessel Traffic Systems (VTS).[10] VTS may constitute anything from a simple check in when abreast certain geographic points to an all pervasive system such as the Federal Aviation Administration utilizes to direct aircraft movement.[11]

6:3 TECHNICAL ASPECTS OF CONTROL

The control aspect of the oil pollution problem represents the component which received the initial onslaught of engineering expertise. Again, the use of qualified personnel becomes the cornerstone of any effective clean-up operation. The creation of

the National Strike Force by the United States Coast Guard presents an excellent prototype of the units which must be trained and employed.[12]

The ability to get anti-pollution devices on scene as soon as possible demands top priority. Therefore, the capacity to transport the devices mentioned below by aircraft must always be considered.

Elimination of the source of the oil constitutes top priority when combating an oil spill. When a tank ruptures, one method entails pumping the oil into a good tank before it can exit through the hull.[13] Another possibility involves adding chemicals to the contents of the ruptured tank which cause the contents to gel so that they can no longer pour out.[14] Once the oil flows out of the tank, a containment barrier can retain the oil in the immediate vicinity of the ship to ease recovery efforts.

Recovery apparatus vary from mere bundles of hay to quite sophisticated machinery. Today the weir-basin system and the disc-drum system appear to be the most efficient recovery tools.[15] The weir-basin technique thickens the oil slick with a barrier so that pumps can effectively conduct the oil. The disc-drum system collects the oil on rotating metal plates and then wipes the oil off into a sump from which it can be easily pumped. Meanwhile, biologists experiment to discover a strain of voracious bacteria which can ingest hydrocarbons.[16]

Oil soaked waterfowl present a difficult problem for recovery personnel. The use of mild non-caustic cleaning solutions and climate controlled areas for rehabilitation markedly increases the bird's chances of surviving such a traumatic experience.[17]

6:4 TECHNIQUES FOR DETERMINING LIABILITY

Liability forms the third element of the oil pollution problem. The technical phase of this element primarily concerns the determination of who discharged the oil into the marine ecosystem.

Airborne Oil Surveillance Systems (AOSS) may prove to be extremely effective. Present systems operate with infrared (IR)

sensors, ultra violet (UV) sensors, and side looking radar.[18] The IR sensors can "see" the oil slick owing to its temperature anomaly, and the UV sensors operate on the phenomenon that oil slicks reflect 20 to 50 percent more UV than does the ocean.

Another possibility revolves about the tagging of the cargo. This can be done with radioactive isotopes to enable investigators to trace any spill back to its source.[19] Other options include the use of coded magnetic dust. This dust involves a cost of $2,500 for a 100,000 gross ton carrier, but electromagnetic filtering provides the capability of reusing the dust again and again.[20]

Sample collection also presents a perplexity for enforcement officials. Researchers have developed herding devices and sorbents which may alleviate this problem in the future.[21]

Finally, good accounting methods must be developed so the plaintiff can accurately prove his clean-up expenditures. The data compiled by the United States Coast Guard can be immensely helpful in arriving at a legitimate cost picture.[22] The Coast Guard has established a solid figure of $8 per gallon as removal costs for spills of less than five thousand gallons.

6:5 SUMMARY

Rather than conducting an exhaustive inquiry into the technical aspects of the oil pollution problem this summary furnishes the reader with an overview of the existing state of the art. The references at the end of the chapter can probide an in depth examination of this technical field.

FOOTNOTES CHAPTER VI

1. See text accompanying note III-47 on the peculiar handling characteristics of supertankers.

2. See text accompanying note VII-34 infra.

3. See text accompanying note VII-34 infra.

4. See text accompanying note VII-34 infra.

5. 33 C.F.R. §§ 155 (1974).

6. 33 C.F.R. §§ 156.170 (1974).

7. 9 TEX. INT'L L. J. 205 (1974) on the legal implications of offshore terminal facilities.

8. 15 C.F.R. §§ 920.15 (1974).

9. Routeing Systems, IMCO, U.N. Doc. AVIII/Res. 284 (1973).

10. 33 C.F.R. §§ 161 (1974).

11. U.S.C. G. VESSEL TRAFFIC SYSTEMS ISSUE STUDY vol. I (1973).

12. An Act to Amend the Federal Water Pollution Control Act of 1970, tit. 1 §§ 11c, 84 Stat. 91.

13. Koburger, The Shadow of the Torrey Canyon, NAVAL ENGINEERS J. , Feb.1974 at 28.

14. Jones, Oil Gelled to Control Spillage From Tanks, The New York Times, Jan. 17, 1972, at 39, col. 5.

15. Leary, R & D Developing Alternatives for High Seas Recovery, II ENVIRONMENTAL PROTECTION NEWSLETTER 10 (1974).

16. Bacterial Growth to Eat Ship's Oil Sludge, The New York Times, Apr. 11, 1973, at 43, col. 11.

17. Oil on the Delaware, II ENVIRONMENTAL PROTECTION NEWSLETTER 3, 5 (1974).

18. Mills, Coast Guard Airborne Remote Sensing System, II ENVIRONMENTAL PROTECTION NEWSLETTER 7 (1974).

19. Tracing Pollution Back to Tankers, The Times (London), Apr. 10, 1973, at 17.

20. Toles, Magnetic TAgs for Oil Spills, 19 SEA FRONTIERS 277 (1973).

21. Deployable Oil Samplers, II ENVIRONMENTAL PROTECTION NEWSLETTER 21 (1974).

22. Pollution Fund Spending Reviewed, II ENVIRONMENTAL PROTECTION NEWSLETTER 14, 15 (1974).

CHAPTER VII

RECENT INTERNATIONAL ACTIVITY

7:1 INTRODUCTION

1972 witnessed the beginning of genuine awareness of the pollution problem on a truly international scale. For the first time, the developing countries joined with the industrial nations in confronting this problem. If all nations can subdue their self-indulgent desires, significant strides can be made towards effective cooperation. The three most important conferences were the Stockholm Conference on the Human Environment, the 1973 IMCO Conference in London, and the on going Law of the Sea Conference.

7:2 STOCKHOLM CONFERENCE

One of the two most recent Conferences which scrutinized the problem of pollution in the marine environment was the United Nations Conference on the Human Environment, which took place in Stockholm during 1972 and resulted in the United Nation Environmental Programme.[1] Although a great deal of preliminary work had been accomplished, the magnitude of the Conference made it an unwieldly organ. At the termination of the Conference, the delegates presented the Declaration of the United Nations Conference on the Human Environment.[2]

Point seven of the Preamble describes the responsibilities which must be undertaken by citizens, communities, enterprises, and institutions at every level in order to stave off environmental disaster. While emphasizing the responsibility of the world's present power sources (local and national governments), the Declaration directs attention to the international scope of pollution and the necessity for "extensive co-operation among nations.[3]

Within the body of the Declaration, Principle 7 extolls States to initiate all possible steps to eliminate pollution of the seas by all harmful substances. This obliges the States to commence affirmative action to prohibit pollution; however, the use of the word "possible" indicates the wide disparity in technological ability. Future conventions must insure a flow of relevant technology to developing countries.[4]

Additionally, the Declaration emphasizes the need for environmental education.[5] The delegates realize that, absent education, the chance of illiciting environmentally responsible conduct from individuals appears highly unlikely. Education also symbolizes the best means of cultivating the human portion of the environment.[6]

Finally, the Declaration describes an action plan for the human environment. The recommendations for action at the international level include the identification and control of pollutants of broad international significance. Within this broad category, Recommendations 86 through 94 concern marine pollution specifically.

First, States with the particular assistance of GESAMP need to insure that they attain a high level of prevention over pollutant sources within their jurisdiction.[7] All States to the best of their ability must also employ data gathering techniques and aid international attempts to collect pollution data.[8]

An economical solution to the pollution problem requires that GESAMP collate international data yearly and revise its assessments so that national efforts may be expended in the most beneficial manner.[9] Recommendation 90 indicates that such information also enables intelligent selection of pollutants for monitoring. GESAMP needs to direct its energies towards the development of early-warning indicators to disclose concentrations of pollutants and the increased compatibility of analytical monitoring techniques.[10]

Lastly, the Declaration recommends that United Nations agencies insure the free and rapid transmittal of environmental information[11] and secure additional financial support to provide the technical training needed by developing countries.[12]

7:3 1973 IMCO CONFERENCE

The most important recent conference on pollution of the marine ecosystem assembled in London during October 1973. Seventy-one parties to IMCO as well as twenty governmental and non-governmental organizations attended.[13] The representatives divided into several committees to handle the plethora of material. Committee I labored on the basic Convention; Committee II concentrated on annexes I, IV, and V concerning oil, sewage, and garbage pollution; Committee IV devoted its time to a Protocol dealing with intervention on the high seas in cases of pollution by substances other than oil.

The preliminary remarks of the Canadian delegation to the Conference appears to epitomize the work of the Committees:

> We welcome bigger ships as long as they are better ships. We welcome more efficient shipping as long as it is also safer shipping from an environmental point of view. We are not against big tankers if oil pollution can be reduced by using them on the right routes and docking them in the right places. We are all for economy as long as it is good economics in the long run.[14]

Seventy-nine States signed the Convention for the Prevention of Pollution from Ships,[15] and sixteen other States added their signatures during the next two years.[16] This Convention contained five annexes and two protocols. When the Convention enters into force it automatically supersedes the 1954 Convention for the Prevention of Pollution of the Sea by Oil as amended.[17]

7:3:1 BASIC CONVENTION

The Convention concerns the discharge from any vessel of harmful substances which include:

any substance which, if introduced into

> the sea, is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea, and includes any substance subject to control by the present Convention.[18]

This Convention applies to the vessels of any Administration (a flag State Contracting Party or a vessel operating under the authority of a Contracting Party).[19] In addition to the Administration's jurisdiction, a violation occurring within the jurisdiction of any Contracting State may be subject to proceedings by that state.[20] Any Contracting State may also inspect any vessel within its jurisdiction to insure that it carries the valid certificate required by the Convention,[21] to inspect for any possible discharges[22] and to preclude further movement of an uncertificated vessel until it undergoes needed repair.[23] In case a violation becomes apparent, Protocol I proscribes a rapid mechanism for notifying both the Administration and IMCO.

In the event of a dispute between Contracting States, Protocol II establishes the ground rules for arbitration.[24] In the event the states fail to concur on a Tribunal, the Secretary-General of IMCO selects the panel.[25]

Each Administration accedes to undertake investigations of any casualties to its vessels which result in environmental damage.[26] Administrations and all other Contracting States further assent to supply IMCO with annual relevant statistics concerning their regulations, vessels, reception facilities, and penalties imposed.[27] Finally in conjunction with IMCO, the Contracting States engage to supply the technical assistance required by this Convention to those Contracting States requesting such aid.[28]

In accepting the Convention, a Contracting State must acquiesce to Annexes I and II dealing with oil pollution and pollution by noxious liquid substances respectively.[29] However, it may refuse to accept any one or all of Annexes III, IV, and V which respectively concern harmful substances carried in packaged forms, sewage pollution,

and garbage pollution.[30] This Convention enters into force when fifteen States ratify and the combined merchant fleets of these Contracting States constitutes more than 50 percent of the world's merchant tonnage.[31]

7:3:2 THE TECHNICAL ANNEXES TO THE 1973 CONVENTION

The technical annexes represent one of the most comprehensive undertakings in international technical cooperation in recent years. The following discussion will attempt to point out significant provisions on the annexes.

7:3:2:1 Annex 1 - Under Regulation 1, the usual definitions are included. The definition of oil has been expanded from the previous limits[32] to include petroleum in any form. The allowable discharge definition of "oily mixture" as 100 PPM is retained.[33] Some minor changes in the definition of "nearest land" off Australia are made and new technical definitions dealing with tank types, measurements and ship construction are added. Regulation 2 extends annex requirements to tankers greater than 150 tons and other vessels greater than 500 tons.[34] Regulation 4 provides for periodic surveys of equipment by the flag State whil Regulations 5 thru 8 provide for the issuance of an International Oil Pollution Certificate showing compliance with the annex.

Under Regulation 9 tankers may discharge oil under substantially the same conditions as provided for in the 1969 Amendments[35] with the added requirement that total quantity not exceed 1/30,000 of the cargo. Additionally, the tanker must have an oil discharge monitoring system, a control system and a slop tank, in operation as set out in Regulation 15. Non-tankers are also permitted to discharge under 1969 Amendment conditions but distances are set at 12 miles in lieu of as far as practicable. In addition to an oil discharge monitoring and control system, non-tankers must have an oily water separator and a filtering system as in Regulation 16. The discharge of "clean ballast" containing less than 15 PPM of oil and not producing a sheen is permitted in all circumstances. Regulation 10 is very detailed, setting up special areas of prohibited discharge such as the Baltic, Black Sea, Red Sea and Persian Gulf. Regula-

tion 11 deals with traumatic discharge, permitting discharge when as the result of damage as long as reasonable precautions taken after discharged or where there was an intentional act, recklessness or gross negiligence. Regulation 12 establishes the requirement for reception facilities for the oil residues retained on board. Regulation 13 establishes the requirement that every newly built tanker over 70,000 DWT have segregated ballast tanks. Ballasting of cargo tanks for these vessels will be allowed only in severe weather. Regulation 14 establishes similar requirements with respect to fuel tanks in non-tankers larger than 4,000 GRT.

Under the provisions of Regulation 15, all tankers over 150 GRT must be provided with oil retention systems for residues, dirty ballast, and tank washings. Retained oil will be kept in slop tanks. Existing tankers have three years to comply and may designate a cargo tank as a slop tank. Oil discharge monitoring and control systems must be fitted with a recording device to record either liters per nautical mile and total discharge or oil content and rate of discharge. These devices must always be in operation during any discharge with an automatic shutdown mechanism when Regulation 9 is exceeded. Short run coastal tankers need not comply but may not discharge.

Requirements for non-tankers under Regulation 16 establish the additonal need for an oily water separator or filtering system designed to keep oil content below 100 PPM. Such systems are required on all ships over 400 GRT and certain other vessels in special classes. Regulation 17 requires sludge tanks on all ships over 400 GRT. Regulation 18 sets out arrangements for piping, pumping, and discharge operations designed to minimize accidental spills. Regulation 19 facilitates the discharge of residues by establishing a universal fitting for vessel and shore equipment.

Regulation 20 retains the requirement of an oil record book established by the 1962 Amendments.[36] The occasions on which entries must be made are expanded. Regulation 21 extends the coverage of the annexes to offshore rigs. Chapter III of Annex I retains

the tank design requirements for minimizing damage discharge from side and bottom tanks established by the 1971 Amendments, Annex C.[37]

7:3:2:2 Annex II - This annex deals with regulations for the control of pollution by the carriage of noxious liquid substances in bulk. These substances are listed and categorized.[38] The discharge of the most harmful type is totally prohibited except when greatly diluted. The discharge of other categories is permitted under varying conditions of speed, dilution, water depth and distance off shore.[39] Special prohibited areas,[40] reception facilities,[41] a cargo record book,[42] equipment surveys,[43] and certificates[44] similar to oil pollution requirements are established. In the appendices of Annex II, the guidelines for the categorization of noxious substances appear in Appendix I, while Appendix II sets forth a list of all such substances and classifies them in accordance with the system of Appendix I. Appendix III lists other liquid substances carried in bulk and which are not considered noxious. The prospective shipper, therefore, receives guidance as to what is and what is not a noxious substance with guidelines which he may employ in determinations for substances not listed. Appendices IV and V set forth the form of the Cargo Record Book and the International Pollution Prevention Certificate for the Carriage of Various Liquids in Bulk.

7:3:2:3 Annex III - The provisions of this annex are optional under Article 14 of the basic convention. The main thrust of this annex deals with the prevention of pollution of the seas by harmful substances carried in packaged forms, containers, portable tanks or road/rail wagons as compared to bulk carriage in Annex II supra. The annex contains broad general provisions requiring contracting governments to develop rules for packaging, marking, handling and storage of these containers. Discharge of substances covered by this annex is prohibited except where necessary to save the vessel or life.[45]

7:3:2:4 Annex IV - This annex is also optional under Article 14 of

the basic convention. The subject matter dealt with is the prevention of pollution by sewage and other discharge of human wastes. The regulations apply to all new ships larger than 200 GRT plus those vessels carrying more than 10 passengers. Existing vessels have ten years to comply with the annex.[46] Requirements for compliance surveys, sewage treatment plants, comminutator systems, holding tanks, and certificates are set forth.

Under Regulation 8, discharge of sewage is prohibited except when using a comminutator and disinfectant and more than 4 nautical miles off the coast. In the case of untreated sewage, discharge is prohibited unless at least 12 nautical miles offshore and while proceeding enroute and discharging gradually. If the vessel has a sewage treatment plant meeting future standards, ie. no visible floating solids or water discoloration, the discharge is permitted.

The annex also establishes a requirement for shoreside reception facilities for retained wastes.[47] Discharge is not permitted under the usual emergency circumstances, or at least there is no provision for such. A standard flange connection for discharge and receipt fittings is provided.[48]

7:3:2:5 Annex V - This annex is also optional. Prevention of pollution by the discharge of garbage from ships is the subject matter. The discharge of plastic is totally prohibited.[49] The discharge of other garbage should be as far from land as practicable but at least 25 nautical miles in the case of dunnage, lining and packaging remains[50] and 12 nautical miles for food wastes and other garbage.[51] Wastes which are passed through a comminutator must also be discharged as far from land as practicable but in no case less than 3 nautical miles. Such discharges must be capable of passing through a screen with openings not greater than 25 millimeters.[52] The provisions of this annex apply to offshore platforms.[53] Special areas similar to those established in other annexes are included[54] and the emergency discharge allowance is also inserted. There is also a requirement for shoreside reception facilities.[55]

7:3:2:6 Protocol I - This protocol establishes, in accordance with Article VIII of the convention, a duty to report incidents involving the discharge of harmful substances.[56] Included are methods of reporting,[57] when to report,[58] and the contents of a report.[59]

7:3:2:7 Protocol II - This annex is established in accordance with Article X of the convention to provide for an arbitration procedure. A three man tribunal is established with one appointed by each party and one by the chairman of the arbitration committee.[60] Procedures are provided for the failure of one party to appoint its arbitrator [61] as well as rules governing the scope of authority of arbitrators,[62] apportionment of costs,[63] joining,[64] rules of procedure,[65] voting,[66] and awards.[67]

7:4 THE 1974 LOS CONFERENCE

In 1969, the UN General Assembly passed a resolution calling the Third UN Conference on the Law of the Sea.[68] A number of nations, including the U.S., opposed such a conference as described in the resolution as too broad to arrive at solutions to the complex problems involved.[69]

The chief aim of the conference was to settle the many controversies existing over the extent of coastal state jurisdiction over the adjacent seas. Many important questions involving transit rights in international straits, fisheries conservation and marine environmental protection are at issue. Unfortunately, most of the concern has been with the much vaunted riches of deep sea bed hard mineral resources and jurisdiction to exploit them.[70]

The Third Committee of the U.S. Seabed Committee, created to do the preparatory work on marine environmental matters for the conference, found their task complicated by the constant absence of delegates to attend other conferences on environmental matters; such as the 1972 Stockholm Conference on the Human Environment and the 1973 IMCO Conference in London.[71] The preparatory materials for the LOS Conference were not as comprehensive as those available for the 1958 Conference.

Many authorities have been very pessimistic about the prospect of any viable solution to the many problems confronting the Law of the Sea coming out of the conference. One of the chief obstacles seems to be the political maneuvering of Third World nations who seem bent on exercising their new found UN political power and forcing unrealistic and unacceptable measures on the maritime powers.[72] Another major problem, from the environmental point of view, is the lack of comprehension of the technical complexities of the pollution problem or even awareness of the gravity of the situation on the part of many diplomats.[73]

The results from the first session of the Conference, held in Caracas in June-August 1974, seem to bear out these gloomy predictions. The ugly head of nationalism and self interest reared up once again and the emphasis was on tactics and maneuvering rather than the accomplishment of workable solutions.[74] Very little was actually accomplished at Caracas other than familiarization with materials, submission of draft articles and some delineation of issues.

The second session in Geneva in March 1975 also produced no concrete results but at least resulted in a single draft text of a treaty which can be used as a basis for negotiation in the next and hopefully final session in New York, January 1976. A few things seem to be highly probable outcomes on the conference. Among these are an expansion (contraction or delineation as the case may be) of the territorial sea to 12 miles and the establishment of a 200 mile Economic Resource Zone (ERZ) wherein the coastal state would have limited jurisdiction.[75]

Environmental aspects of the Law of the Sea are being handled by Committee III. There is great dissension between developing countries and industrial nations. The former are reluctant to subject their development plans to the restrictions of pollution controls. While there seems to be a trend against the setting of pollution standards by the coastal state,[76] this does not preclude the enforcement of uniform international standards within the ERZ

by the coastal state. The U.S. opposes efforts to restrict the rights of coastal states to impose and enforce requirements for the protection of the marine environment additional to or more stringent than international standards.[77]

Thus far, most discussions of marine environmental protection have been concerned with development of the deep sea bed hard mineral resources. However, if the 200 nautical mile ERZ becomes international law, it will probably include a provision authorizing the coastal state to take measures to protect the environment. Some types of international uniform standards may have to be set, however, in order to avoid the problem of burdensome multiplicity of requirements.

FOOTNOTES CHAPTER VII

1. See text accompanying note IV-50 *supra*.

2. Declaration of the United Nations Conference on the Human Environment, *adopted* Jun. 16, 1972, 11 INT'L LEG. MATS. 1416 (1972) (hereinafter Stockholm Con.).

3. *Id*. Preamble 7.

4. See text accompanying note VII-28 *infra*.

5. Stockholm Con. Principle 19.

6. See text accompanying note I-39 *supra*.

7. Stockholm Con. recommendation 86.

8. *Id*. recommendation 87.

9. *Id*. recommendation 88.

10. *Id*. recommendation 90.

11. *Id*. recommendation 93.

12. *Id*. recommendation 94.

13. Waldichuck, *IMCO International Conference on Marine Pollution*, 1 OCEAN MANAGEMENT 277, 278 (1973).

14. *Id*. at 285.

15. 1973 Convention for Prevention of Pollution from Ships, *done* Nov. 2, 1973, 12 INT'L LEG. MATS 1319 (1973) (hereinafter 1973 Prevention Convention)

16. 13 INT'L LEG. MATS. (1974) and 14 INT'L LEG. MATS to 1102 (1975).

17. 1973 Prevention Convention art. 9.

18. *Id*. art. 2.

19. *Id*. art. 3.

20. *Id*. art. 4 (2).

21. Id. art. 5 (2).

22. Id. art. 6 (2).

23. Id. art. 5 (2).

24. Id. art. 10.

25. Id. protocol II art. IV.

26. Id. art. 12.

27. Id. art. 11.

28. Id. art. 17.

29. Id. art. 19.

30. Id. art. 14.

31. Id. art. 15.

32. Art. I, §§ 1, 1954 Convention for the Prevention of Pollution of the Sea by Oil, Dec. 8, 1961, 12 U.S.T. 2989, T.I.A.S. No. 4900, 327 U.N.T.S. 3 amended by 1962 Amendment to the Convention for the Prevention of Pollution of the Sea by Oil, May 18, 1967, 17 U.S.T. 1523, T.I.A.S. No. 6109, 600 U.N.T.S. 332 (hereinafter cited as 1954 Convention as amended).

33. Oil diluted at this level still presents significant hazards particularly that of the absorption of oil into the food chain which is perhaps the most dangerous element of the marine oil pollution problem in the long run. R. SHINN, THE INTERNATIONAL POLITICS OF MARINE POLLUTION CONTROL (1974).

34. Similar to Art. II, § 1 (9) of the 1954 Convention as amended.

35. 1969 Amendment to the Convention for the Prevention of Pollution of the Sea by Oil, done Jan. 16, 1970, 9 INT'L LEG. MATS. 1 (1970).

36. Art. IX, 1954 Convention as amended.

37. 1971 Amendment to the Convention for the Prevention of Pollution of the Sea by Oil, adopted Oct. 15, 1971, 11 INT'L LEG. MATS. 267 (1972).

38. 1973 Prevention Convention categories A, B, C, and D.

39. Id. REG. 5, Annex II.

40. Id. REG. 8, Annex II.

41. Id. REG. 7, Annex II.

42. Id. REG. 9, Annex II.

43. Id. REG. 10, Annex II.

44. Id. REGS. 11 & 12, Annex II.

45. Id. REG. 7, §§ 1, Annex III.

46. Id. REG. 2, Annex IV.

47. Id. REG. 10, Annex IV.

48. Id. REG. 11, Annex IV.

49. Id. REG. 3 (1) (a), Annex V.

50. Id. REG. 3 (1) (b) (i), Annex V.

51. Id. REG. 3 (1) (b) (ii), Annex V.

52. Id. REG. 3 (c), Annex V.

53. Id. REG. 4, Annex V.

54. Id. REG. 5, Annex V.

55. Id. REG. 7, Annex V.

56. Id. art. I, Protocol I.

57. Id. art. II, Protocol I.

58. Id. art. II, Protocol I.

59. Id. art. IV, Protocol I.

60. Id. art. III, Protocol II.

61. Id. art. IV, Protocol II.

62. Id. art. V, Protocol II.

63. Id. art. VI, Protocol II.

64. Id. art. VIII, Protocol II.

65. Id. art. VIII, Protocol II.

66. Id. art. IX, Protocol II.

67. Id. art. X, Protocol II.

68. Resolution 2574A, 23 U.N. GAOR, Supp. 17, UN DOC./7630.

69. Dole & Stang, Ocean Politics at the UN, 50 OREGON L. REV. 378, 379 (1971).

70. Id.

71. Id.

72. Friedham, A Law of the Sea Conference - Who Needs It?, in INTERNATIONAL RELATIONS AND THE FUTURE OF OCEAN SPACE 44 (R. Wirsing, ed. 1974).

73. Id.

74. U. S. DELEGATION REPORT ON THE THIRD U. N. CONFERENCE ON THE LAW OF THE SEA, CARACAS, VENEZUELA, June 20 to Aug. 29, 2 (1974).

75. Id.

76. Id. at 17.

77. U. S. Draft Article 5 for a Chapter on the Economic Zone and Continental Shelf. A/CONF. 62/C.2/L.47, August 8, 1974.

CHAPTER VIII

SUMMARY AND CONCLUSIONS

That oil pollution of the marine ecosystem presents a severe ecological threat has been clearly established. Most nations and authorities are in agreement that it is a problem and must be controlled. Less clear is what must be done and who should do it.

Prevention of operational vessel discharges continues to be a major factor in marine oil pollution. Although far from perfect, particularly with respect to weak enforcement provisions and the continued allowance of discharge at harmful levels, the 1973 Prevention Convention presents the most comprehensive and far-reaching measure ever adopted in this area. Before ecologically idealistic goals such as total discharge prohibitions and strict enforcement by a Global EPA are pursued, the present practically-oriented measures of the 1973 Prevention Convention must first be made effective. Future efforts at the prevention of pollution in the operational area should be limited to effective implementation of these measures. Upon achievement of such a level of prevention, discussion of wider ranging mechanisms will be more realistic. The United States Coast Guard has already taken preliminary steps to implement all the provisions of the treaty for U. S. vessels by 1978 under the authority of Title II of the Ports and Waterways Safety Act of 1972 and other statuatory provisions.[1]

One area of pollution prevention which still represents great potential for international cooperation is traumatic vessel source pollution. The elimination of massive traumatic discharges would eliminate two-thirds of the world oil pollution problem.[2] The high interest of all parties in safety should also facilitate acceptance of such measures. With the very high possibility of a 200 nautical mile ERZ coastal state jurisdiction with commensurate rights and

duties of marine environmental protection resulting from the LOS Conference, international efforts should concentrate on the elimination of such discharges by coastal state measures. Such measures might include improved navigational facilities and aids, vessel traffic control, higher personnel training standards, better charts and surveys and bridge to bridge communications (inter-vessel). Again, the United States leads in this area requiring radio communications to be available under the Vessel Bridge-to-Bridge Radio Telephone Act of 1971.[3] The Coast Guard has also made great strides in Vessel Traffic Systems (VTS). Under the authority of Title I of the ports and waterways Safety Act of 1972, several ports already have VTS and many such systems are planned.[4]

International efforts for uniformity of frequency, procedure, equipment and regulation similar to that of the air transport industry should be undertaken. The United States, whose Coast Guard is one of the leaders in the field both in the areas of technology and experience, should endeavor to aid other nations in the establishment of comprehensive collision and grounding prevention systems.

Control of pollution has been an area of great technological gains in recent years. International cooperation for the dissemination of technological and procedural information on control and clean-up should proceed with a minimum of conflict. Again, the U. S. could be a leader in this area. The recent dispatch of a U. S. Coast Guard Oil Pollution Strike Force to Chile averted ecological disaster when the Dutch 200,000 DWT tanker Metula ran aground in the Straits of Magellan. Working with Dutch and Chilean salvage teams, they prevented the spillage of millions of gallons of oil and aided in the control and clean-up of the spillage which had already occured.[5] This operation was an excellent example of international cooperation at its best and was repeated in January 1975 in aiding the Malaysian and Indonesian governments in the grounding of the Showa Maru.[6] The establishment of international

pollution strike forces and equipment stock piles to facilitate this type of operation should be the subject of intense study.

Technology has also advanced to aid the fight against traumatic pollution by providing a means for removing it from the fragile coastal ecosystem altogether. Deepwater ports not only provide a method of deepwater anchorages for supertankers and jumbo LASH vessels, but they are cheaper than conventional port facilities. With the passage of the Deepwater Ports Act of 1974,[7] the way is clear for the establishment of a number of such ports. Obsolete and crumbling port facilities can be put to better uses, ecologically harmful dredging of supertanker channels is prevented, and the oil tankers themselves are kept out of coastal waters. Secondary benefits exist in the form of reduced costs through utilization of larger tankers and elimination of transshipment as well as generally reduced traffic density around ports.

The question of liability for oil pollution is closely tied to prevention. The delegation of enforcement jurisdiction to an international organization seems unlikely in view of the prevailing political climate as revealed at the Caracas Conference. With flag State enforcement a reality which must be dealt with for the foreseeable future, assistance to small flag of convenience nations in enforcing such measures as well as economic incentives for them to do so should be considered. Voluntary observance could also be encouraged by a government pollution damage insurance program. Such a program would allow a vessel owner observing all equipment and training requirements and recommendations to limit his liability as well as to predicate such liability on fault. The owner observing required provisions but not recommended measures would have a higher limitation and strict liability. The owner failing to comply with any standards would be for all intents uninsurable, would have no limitation, and would be absolutely liable. Technical advances such as airborne spotting sensors and chemical "tags" to trace spilled oil promise great hope for stricter enforcement capability with attendant deterrent and preventive effects.

Shoreside transfer and storage operations also represent a major area of pollution. Since such areas are normally wholly within domestic jurisdiction, they are not a proper subject for full international efforts. Developed nations, particularly the U.S., could, however, provide technical assistance and training to foreign industry and enforcement personnel. Such cooperation in this area of domestic pollution control (including the exchange of technical information) has been the subject of a working agreement between the U.S. and the U.S.S.R.[8]

The creation of an international organization to deal with the problem of oil pollution of the marine environment is frequently suggested but seems unnecessary in view of the plethora of international organizations already in the area. A possibly feasible organization might concern itself strictly with the "nuts and bolts" approach to pollution and control; leaving the scientific aspects of causes and effects of pollution, legal aspects of liability, etc., to other organizations. The success of such an organization would be predicated on the highest standards which nations are willing to accept.[9] Pollution arises from a variety of commercial and state activities. Any measures connected therewith must be politically acceptable, scientifically possibly, technically feasible and commercially tolerable.[10] This institutional lowest common denominator approach results in cost/benefit analysis--the latest rage of the ecological scene. Under such precepts, some level of pollution must be accepted in light of the higher economic cost of total prohibition.[11] Unfortunately, the costs of pollution for such a cost/benefit analysis are not always economic nor are they totally known. Additionally, budget cuts caused by inflation and recession, ironically oil induced, causes cut backs in anti-oil pollution efforts by the Coast Guard including less supervision of oil transfer operations, reduction of pollution sensor equipped aircraft and detection patrols as well as prevention efforts generally.[12] If pollution prevention is important those charged with the task must be provided with the necessary means.

It remains to be seen whether effective international cooperation for the prevention of marine oil pollution will become a reality while there is still time for action. In spite of encouraging signs of increased awareness and efforts, one is reminded of similar warnings which have gone unheeded until it was too late. " The energy of economic exploitation seems far greater than the energy of community welfare on all levels of social organization."[13]

The example of the continued massacre of whales in spite of an early identification of the problem, scientific analysis of cause, effect and solution as well as repeated efforts at solution by some of the most progressive international treaties, is illustrative of the fact that the decision of whether the oceans live or die must presently depend on the international political process.[14]

FOOTNOTES CHAPTER VIII

1. PL 92-340, 86 Stat. 424, 46 USC 391a (supp 1975)

2. Bates & Yost, Where Trends the Flow of Merchant Shipping?, in THE LAW OF THE SEA: THE EMERGING REGIME OF THE OCEANS 249, 278 (J. Gamble ed. 1973).

3. 33 USC 1201 et seq (Supp. 1975)

4. See generally R. Hill, Collisions and Groundings, Preventing the Unpreventable, U. S. Naval Inst. Proc. 45 (Dec. 1974)

5. U. S. COAST GUARD, COMMANDANT'S BULLETIN, (service newletter) Nov. 1, 1974 at 7.

6. see text accompanying note III-24 supra.

7. P. L. 93-427, 88 Stat. 2126.

8. THE NEW YORK TIMES, Sept. 22, 1972, at 12 col. 1.

9. T. Mensah, The IMCO Experience, in LAW, INSTITUTIONS & GLOBAL ENVIRONMENT 237, 241 (J. Hargorve ed. 1972).

10. Id. at 244-5.

11. D. Serwer, International Cooperation for Pollution Control, in Hargrove, supra, note 9, at 178, 190.

12. THE NEW YORK TIMES, Mar. 30, 1975, at 43, col. 1.

13. A. KOERS, INTERNATIONAL REGULATION OF MARINE FISHERIES 221 (1973).

14. Id.

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